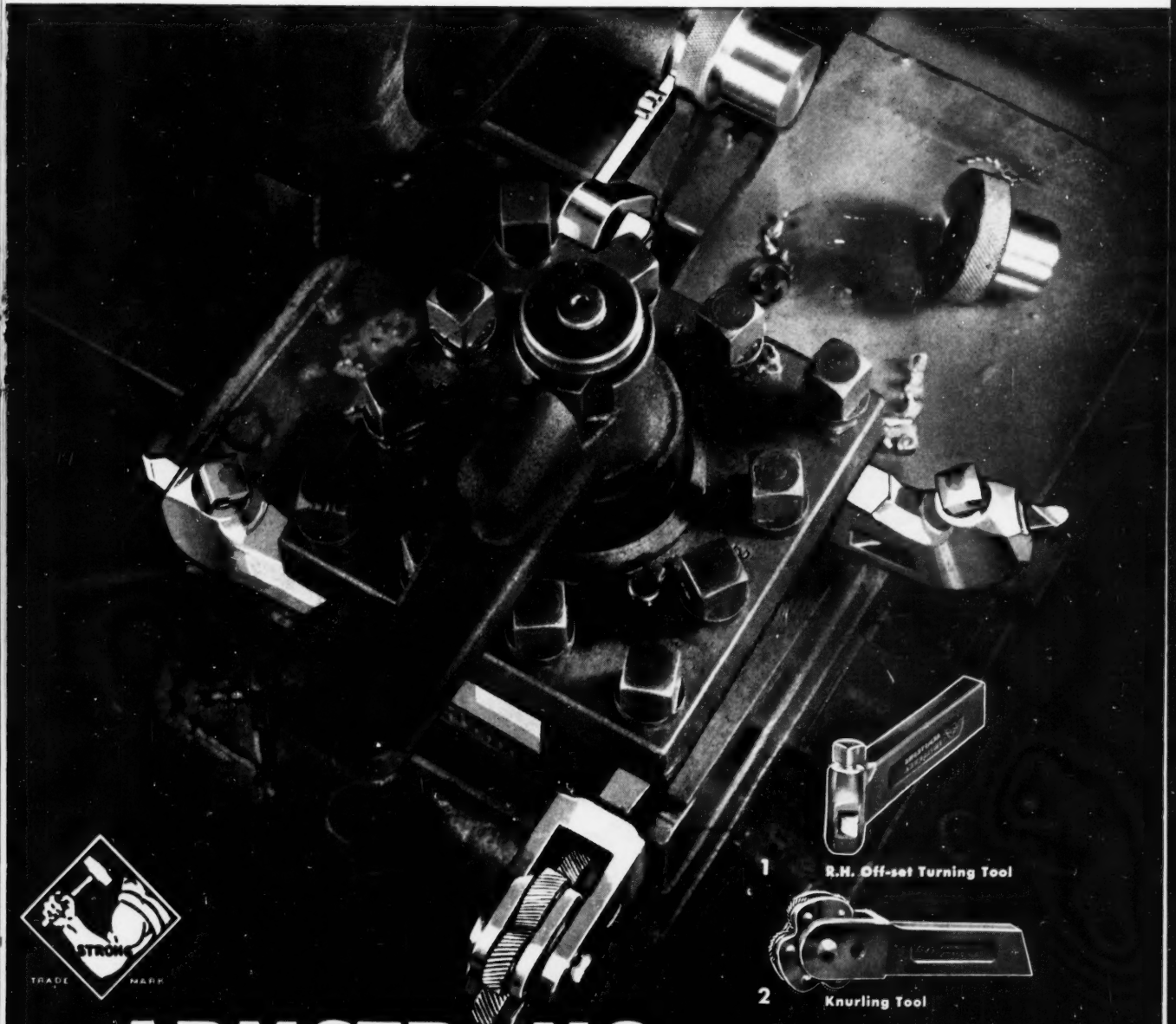
JANUARY 1954—SIXTIETH YEAR

MACHINERY



1 R.H. Off-set Turning Tool

2 Knurling Tool



3 Straight Turning Tool



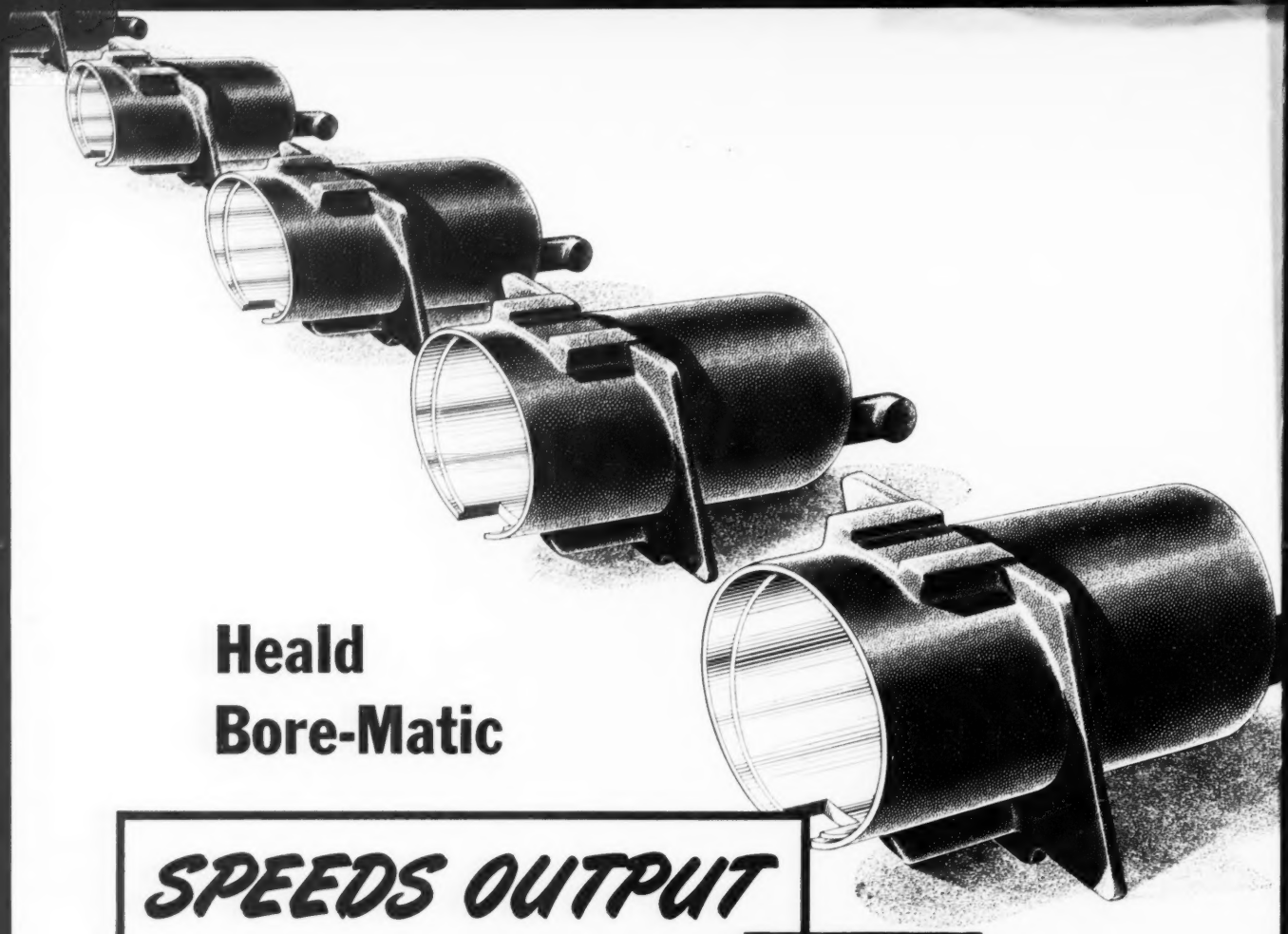
4 Straight Cutting-off Tool

STRONG TRADE MARK

ARMSTRONG
System of **TOOL HOLDERS**

ARMSTRONG TOOL HOLDERS are finding increasing use in production departments. Their great strength and rigidity assure accuracy at any speed or feed. The Armstrong design principle, of inserted tool bits in permanent drop forged shanks, reduces tooling-up time. The use of ARMSTRONG TOOL HOLDERS ends costly delays and profitless "down time." ARMSTRONG TOOL HOLDERS are carried in stock by industrial distributors everywhere.

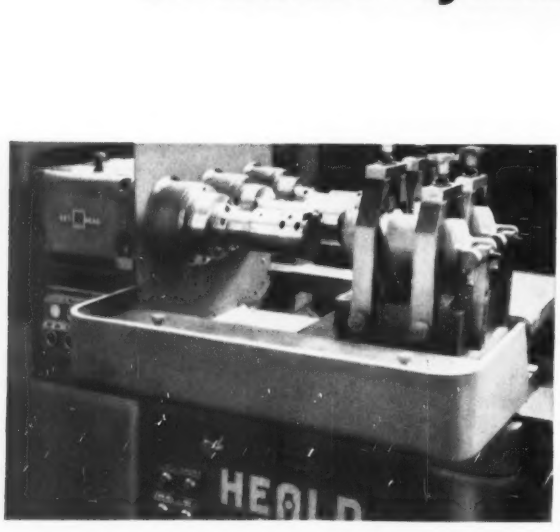
ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* **CHICAGO 30, U.S.A.**



Heald Bore-Matic

SPEEDS OUTPUT

of ironer cylinders 67%



• WHEN YOU COMBINE high cycle speeds, multiple boringheads and automatic indexing, you'll get faster, better production every time. The Heald Model 321 Bore-Matic shown at the left is a typical example.

By performing both roughing and finishing operations on two parts at a single loading, this machine speeded up the job by 67%. Three boringheads are used — the outer two for roughing the cast iron cylinders, and the center one for the finishing operation. A two station fixture on the cross slide indexes the work automatically. Parts are located in a Vee block fixture, with quick-acting clamps for easy loading and unloading.

Remember — when it comes to precision finishing, it pays to come to Heald.

Internal and Rotary Surface Grinding Machines and Bore-Matics

HEALD

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Offices in Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

MACHINERY
Editorial, Advertising and
Circulation Offices
148 Lafayette St., New York 13, N. Y.

Editor
CHARLES O. HERB

Associate Editors
FREEMAN C. DUSTON
CHARLES H. WICK
EDGAR ALTHOLZ

Book Editor
HOLBROOK L. HORTON

•

THE INDUSTRIAL PRESS
Publishers

ROBERT B. LUCHARS
President

EDGAR A. BECKER
Vice-President and Treasurer

HAROLD L. GRAY
Secretary and Publishing Manager

•

Advertising Representatives
WALTER E. ROBINSON
DWIGHT COOK
148 Lafayette St., New York 13, N. Y.

GEORGE H. BUEHLER
228 N. LaSalle St., Chicago 1, Ill.

NORMAN O. WYNKOOP, Jr.
15937 W. Seven Mile Road
Detroit 35, Mich.

DON HARWAY & COMPANY
1709 W. Eighth St., Los Angeles 17, Calif.

MACHINERY, published monthly by The Industrial Press, Emmett St., Bristol, Conn. Executive offices 148 Lafayette St., New York 13, N. Y.

Subscription Rates: United States and Canada, one year, $4; two years, $7; three years, $8; foreign countries, one year, $7; two years, $13. Single copies, 40 cents. Changes in address must be received by the fifteenth of the month to be effective for the next issue. Send old as well as new address. Copyright 1953 by The Industrial Press.

Entered as second-class mail matter May 25, 1953, at the Post Office at Bristol, Conn., under the Act of March 3, 1879. Printed in the United States of America.

British Address
National House, West St.
Brighton 1, England

French Address
15, Rue Bleue
Paris-IX*, France



MACHINERY

VOLUME 60 JANUARY, 1954 NUMBER 5

The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

SHOP PRACTICE

Machining Turbine and Compressor Parts for Sapphire Jet Engines ..... *By Charles H. Wick* 157
Magnetic Tape Programming of Machine Tools *By Lawrence R. Peaslee* 166
Selecting, Operating, Servicing Portable Electric Tools *By Blaine B. Ramey* 173
Shoe Centerless Internal Grinding Attains New Standards of Accuracy ..... *By Walter A. Boyd, Jr.* 178
Cost Reduction Program that Saved $3,800,000 in 1953 *By E. E. Hartzler* 181
Boring and Grinding Machine Maintains Work Concentricity ... 191
Machine Tool Builders Perform "Impossible" Salvaging Jobs *By Iver G. Freeman* 194
Surface Tempering Caused by Grinding .... *By Gordon Murphy* 202
Automated Assembly of Aircraft Engines 213

MACHINE TOOL AND DESIGN

How Form Tolerances Affect Gaging Requirements—Part IV *By Earle Buckingham* 184
Safety Attachment Designed for a Reciprocating Movement *By L. Kasper* 206
Hydraulically Operated Cross-Slide for a Copying Lathe 207
Quick-Acting Milling Fixture for Square Bars .. *By Robert Mery* 209
Fixture for Cropping Split Rings from Coiled Wire Stock *By W. M. Halliday* 210
Die with Two Identical Members to Simplify Machining and Assembly ..... *By Federico Strasser* 211
Lathe Attachment for Machining a Spherical Punch and Die *By Ralph T. Stewart* 212

MANAGEMENT PROBLEMS AND MEETINGS

Quick Government Decisions Urged for Machine Tool Industry *By Loring F. Overman* 153
New Metal-Working Equipment a Bargain in 1954! *By Charles O. Herb* 155
Landis Machine Co. Celebrates Fiftieth Anniversary 190
A.S.M.E. Annual Meeting Had a Record Number of Sessions ... 204
A Dynamic Replacement Policy ..... *By Bernard Lester* 214

DEPARTMENTS

Keeping up with Washington 153
Materials of Industry 198
In Shops Around the Country 200
Ingenious Mechanisms 206
Tool Engineering Ideas 209
The Sales Engineer 214
The Latest in Shop Equipment 216
New Catalogues 247
Between Grinds 253
News of the Industry 254
Data Sheet (Index) 257
Coming Events 264

Product Directory 290

Advertisers Index 415–416



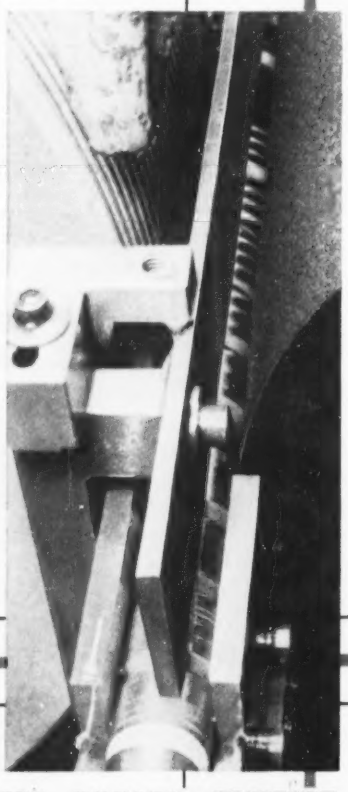
ROTARY & STATIONARY DIE HEADS

A LANDMATIC Hardened and Ground Head is shown threading sucker rods to API tolerances at the Axelson Manufacturing Co. (Division of Pressed Steel Car Co.). 1 1/16" threads are cut on 4621 SAE steel rods at 25 surface feet per minute, with 1500 pieces produced between chaser grinds. This is one of 102 sizes and styles of LANDIS Threading Heads designed for commercial and precision threading.



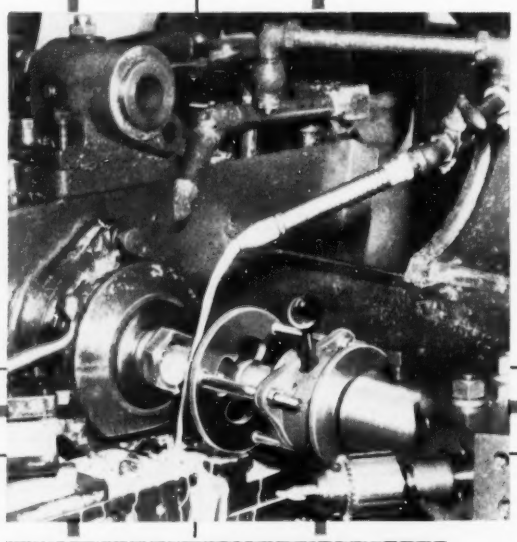
PIPE & BOLT THREADING MACHINES

A #4 LANDMACO Threading Machine is shown cutting 1½" 12 pitch UN threads 2 29/32" long on **Unbrako** Screw Products to Class 3 fit at The Standard Pressed Steel Co. This is one of 90 sizes and styles of LANDIS Threading Machines having a bolt range from 3/16" to 6" and a pipe range from ⅛" to 20".



CENTERLESS THREAD GRINDING

Five threading passes have been eliminated in the production of slack adjuster gear worms at Bendix-Westinghouse by using LANDIS Centerless Thread Grinders. 3½ pitch threads are ground on gear worm blanks of alloy steel heat-treated to 285-311 Brinell hardness in one roughing and one finishing pass. These LANDIS Thread Grinders will thread all diameters from 1/16" to 4¾".



WIDE RANGE COLLAPSIBLE TAPS

The LANDIS ALT Tap, shown threading brass valve bonnets for 6500 pounds test pressure at the Combination Pump Valve Co., illustrates the LANDIS Tap **detachable head** feature. Four heads allow this Tap to thread nine diameters between 1⅜" and 3¼". This is one of 130 sizes and styles of LANDIS stationary and rotary Taps furnished for tapered or straight threading, with a range from 1¼" to 13⅜".

CUTTING
GRINDING
TAPPING
THREADS?

Here is a Complete Line of Thread Generating Equipment--and 50 Years of Engineering, Research, and Production Experience to Help You Produce Those Threads FASTER—BETTER—CHEAPER.

• LANDIS *Machine* CO.

WAYNESBORO PENNSYLVANIA •

281-2C

Report from Peoria...on Big-Gear



Caterpillar
REG. U. S. PAT. OFF.

selects Fellows 36-Type Gear Shapers, at its Peoria Plant, for high production on unusually wide-face steering clutch drum gears for its Track-type Tractors and No. 6 Shovels.*

**Specially arranged for 8" face-width; standard face-width capacity is 6".*

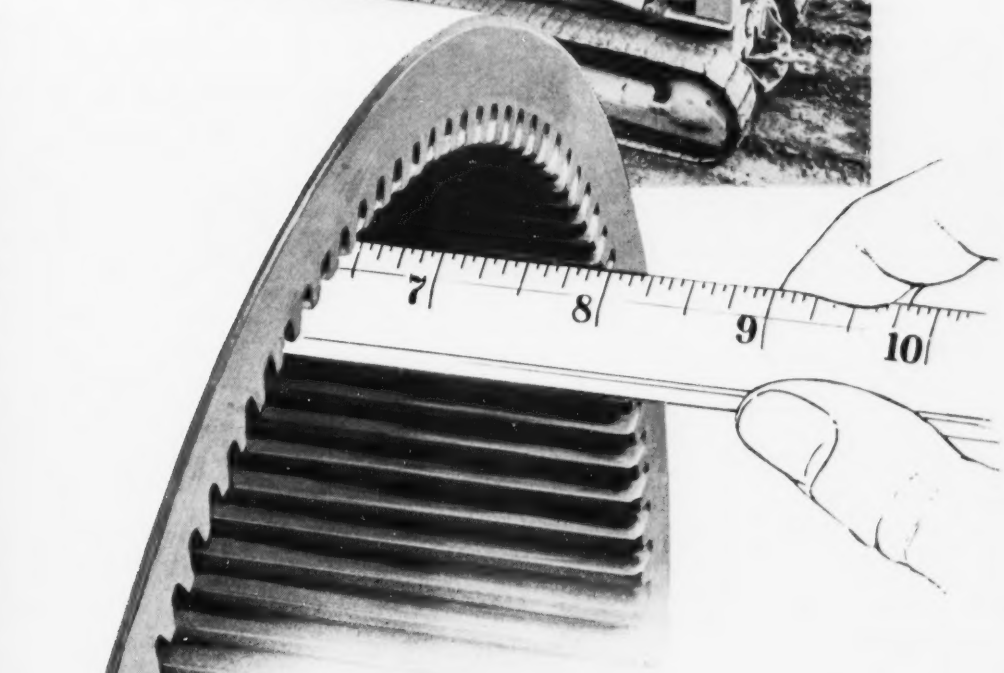
Time-study Performance: Internal C.I. Gear with 128 8-pitch teeth of 8 inches face width – ACTUAL CUTTING TIME, 29.339 MINUTES. Finished in one cut with Gear Shaper operating at 50 strokes per minute, .0408" rotary feed.

THE *Fellows*

Cutting







The heavy-cut, high-speed capacity of the 36-Type Fellows Gear Shaper makes it a profitable investment wherever quality work is to be turned out on a low cost basis.

Shift-lever and dial controls save set-up and operating time. Choice of 12 cutter-spindle speeds and 12 rotary feeds. Big machine rigidity throughout holds work to traditional Fellows precision. Rated for work up to 36″ diameter; spur or helical involute gears; cams or other irregular shapes. *Write for details.*

GEAR SHAPER COMPANY

Head Office and Export Department: 78 River Street, Springfield, Vermont.
Branch Offices: 323 Fisher Building, Detroit 2 • 5835 West North Avenue, Chicago 39.
2206 Empire State Building, New York.

For more information on products advertised, use Inquiry Card, page 247

UNIQUE SET-UP

Automatically End-Mills Radius

. . . improves finish and production

PRODUCTION DATA:

Part name	Fitting
Material	Cast iron
Operation	Mill 2¼" radius
Cutting speed	395 feet/min.
Feed	6¾ inches/min.
Depth of cut	⅛"
Cutter	5" diameter, sintered carbide teeth
Production	51 per hour

Principle of operation. Heavy line indicates milled surface.

A high-quality finish on the radius end of cast iron fittings was a stumbling block to production until Cincinnati Application Engineers studied the job. Their analysis indicated that the work could be machined to advantage by the milling process, on a standard CINCINNATI No. 1-18 Plain Automatic equipped with two rotary attachments. ¶The two attachments are arranged in tandem, driven from an electric motor through V-belts and a four-step pulley to give a selection of four rotary feed rates. The cycle is completely automatic, started with a single lever, milling one part while the other fixture is being loaded. Safety is engineered into the equipment through an ingenious arrangement of limit switches which engage a solenoid operated interference to the starting lever, preventing it from being accidentally moved while the cycle is progressing. Other limit switches retract the starting lever interference and stop the fixture motor after the cut has rotated through 180°. ¶Both large and small shops can benefit from the low-cost production possibilities of CINCINNATI No. 1-18 Plain Automatics. Their fast two-way automatic cycle (300 inches/min. rapid traverse) keeps production going at a high rate . . . their automatic backlash eliminator is highly desirable for down-milling and reciprocal milling set-ups . . . table ways directly on top of knee provide extra rigidity . . . pick-off gears and other features of low set-up time bring automatic production within reach of the small lot manufacturer. Would you like to know more about these small low-cost producers of high-quality milling operations? Brief specifications will be found in Sweet's Machine Tool Catalog file. For complete data, write for publication No. M-1555-2.

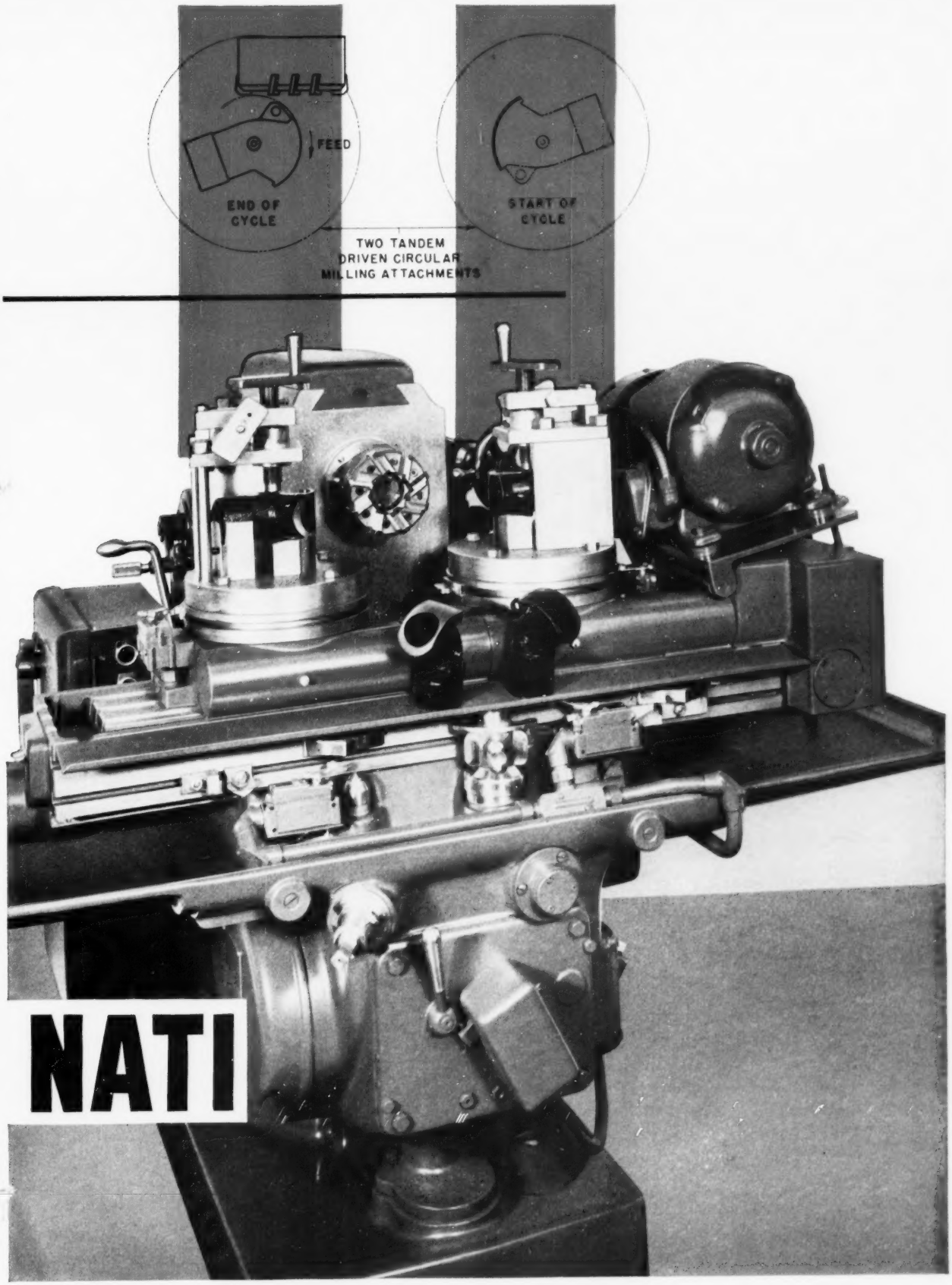
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



CINCINNATI No. 1-18 Plain Automatic Milling Machine. Complete specs. may be obtained by writing for catalog No. M-1555-2.

CINCINNATI

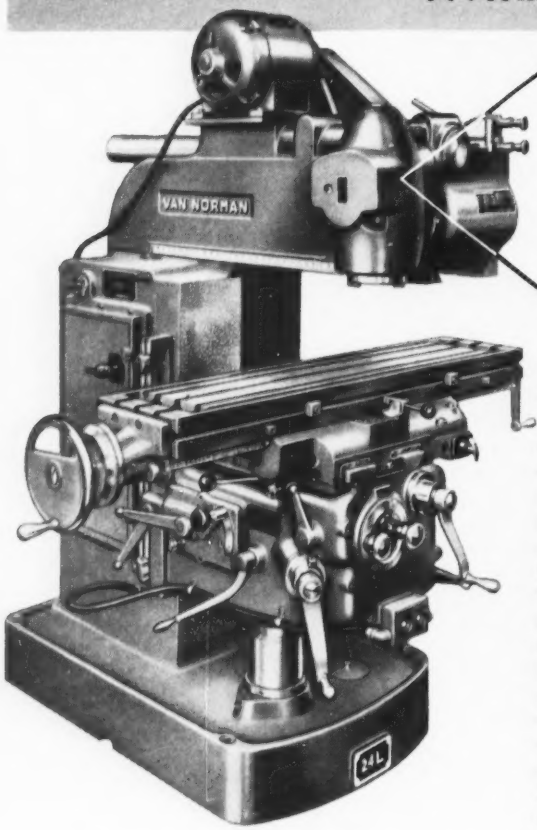
MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • METAL FORMING MACHINES
FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID


FEED
END OF CYCLE
START OF CYCLE
TWO TANDEM
DRIVEN CIRCULAR
MILLING ATTACHMENTS

NATI

New 10 MODELS VAN NORMAN Ram Type Milling Machines

Providing Maximum "Flex-Ability" and "Cut-Ability" ...Will REDUCE Milling Costs!



No. 24L shown is 1 of 10 new models



Adjustable cutterhead permits horizontal, vertical as well as angular milling on one machine.

Van Norman Plus Features

"Flex-Ability" is increased with the *new*, improved heavy-duty adjustable cutterhead which has 90° adjustment . . . permits horizontal, vertical as well as angular milling.

"Cut-Ability" is increased with the *new* box type column, with its heavier and wider cross sections whose internal ribbing provides utmost rigidity. This generous ribbing provides maximum strength, assuring rigid support for the extra long ram, as well as the heavy knee.

"Cut-Ability" is increased with the *new* heavy motorized knee. The direct drive feed motor is mounted on the knee. The 10 models provide a selection of horsepower from 3 to 10.

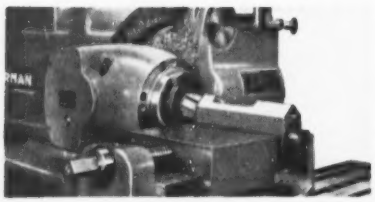
"Flex-Ability" is increased with the *new* extended, large, heavy-duty ram, which increases the capacity of the miller . . . permitting maximum cuts over the entire ram range to the full capacity of the motor.

"Cut-Ability" is increased with the *new* heavy knee, saddle and table assembly . . . designed as a unit to provide maximum rigidity and accuracy.

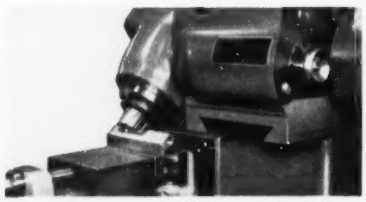
"Flex-Ability" is increased by the spindle motor that drives cutterhead only . . . permits every type of milling with all types of cutting tools.

Write for more information about these new Van Norman Ram Type Milling Machines.

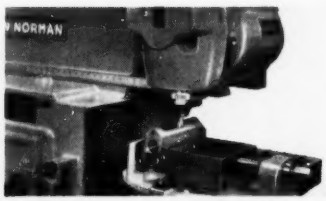
Maximum "FLEX-ABILITY" with the VAN NORMAN Adjustable Cutterhead



A typical horizontal milling operation performed on the new Van Norman Ram-type Miller.



An angular milling operation performed on the same work piece. Note work piece remains in the same set-up. Angular range of cutterhead 0°-90°.



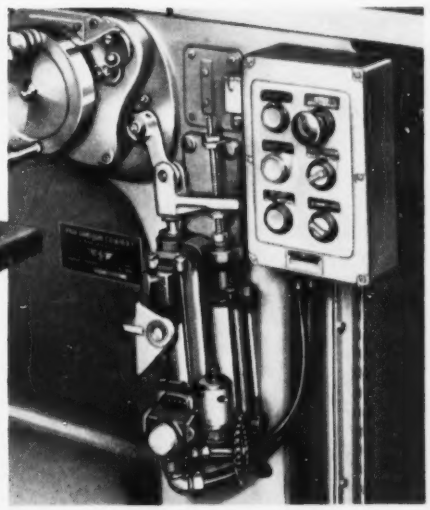
With the cutterhead locked in vertical position a slot is milled in the work piece. Note the set-up has not been changed.

VAN NORMAN — manufacturers of — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

New "AUTO-CYCLE" INFEED ATTACHMENT

provides Completely Automatic cycle for plunge grinding on Van Norman No. 418 Cylindrical Grinders





The Van Norman No. 418 Grinder with "AUTO-CYCLE" is your answer to today's close tolerance grinding requirements. With "AUTO-CYCLE" the No. 418 will repeat to plus or minus .0001". "AUTO-CYCLE" is hydraulically and pneumatically controlled. Fine feed is easily and quickly adjusted to the desired rate.

Plus Features on the No. 418 Grinder

- Wheel spindle is of unit type construction — totally enclosed with double row precision cylindrical roller bearings, proved on thousands of Van Norman Grinders, assuring maximum accuracy and long operating life.
- Heavy-duty headstock and footstock for rigidity, accuracy and smooth grinding.
- Automatic starting and stopping of headstock and table traverse.
- Rugged base, with wide table bearing ways. Separate motor drives for wheel spindle, table and headstock.
- Controls are conveniently grouped in front of grinder for ease of operation.
- One-shot metered lubrication for all bearing surfaces on ways.
- Capacity 4" x 18". Can be purchased with or without "AUTO-CYCLE".

Write for complete information. Ask for prices. They're remarkably low for such high quality equipment.

VAN NORMAN COMPANY, Springfield 7, Massachusetts

Low Cost Precision Grinder

For General Purpose Grinding



LANDIS 12" x 28" Grindwell
for manufacturing, maintenance,
toolroom and training purposes.

LANDIS

precision grinders

Operations

LANDIS
12" x 28" Grindwell precision cylindrical grinder.

Look at these 10 money saving features for

Quick Set-up
Flexible Operation
Precision Grinding
Fine Finishes

1. Microsphere wheel spindle bearings
2. Variable infinite speed headstock
3. 12" swing—28" between centers
4. Live and dead spindle headstock
5. 12" diameter grinding wheel
6. Coolant pump and integral coolant reservoir
7. Two speed hand traverse
8. Precision coarse or fine wheel feed
9. Four speed power traverse
10. Swiveling headstock, wheel base and work table

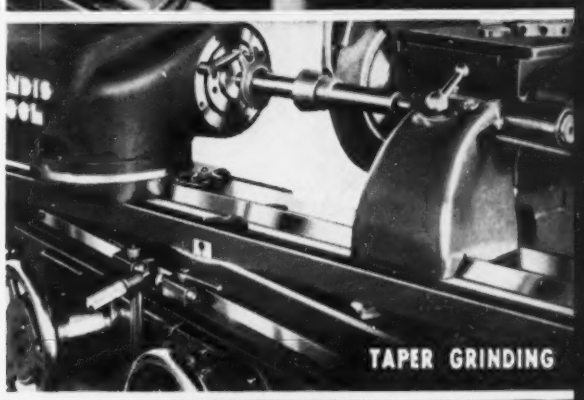


for detailed information, specifications and extra equipment available, write for Bulletin S-49

LANDIS TOOL COMPANY
WAYNESBORO, PENNA., U.S.A.

166


STRAIGHT GRINDING


TAPER GRINDING


FACE GRINDING


INTERNAL GRINDING


WHEEL BASE SET AT ANGLE

U. S. SLIDE



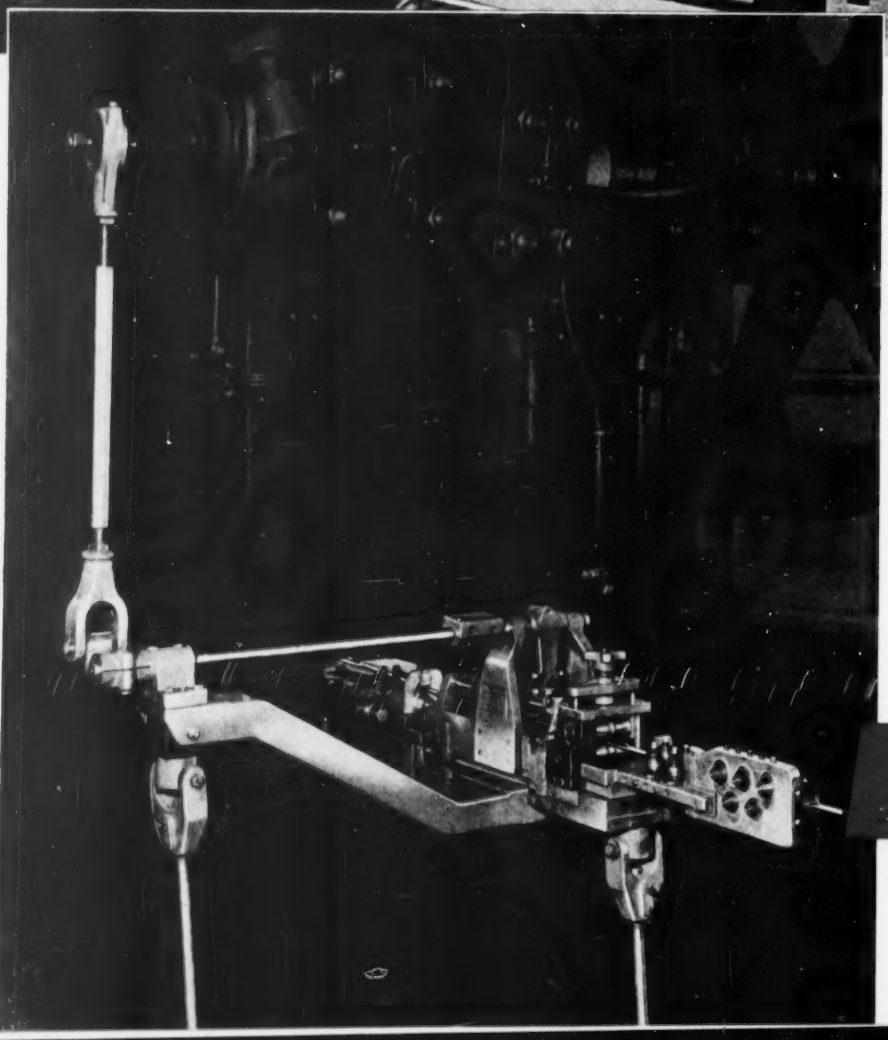
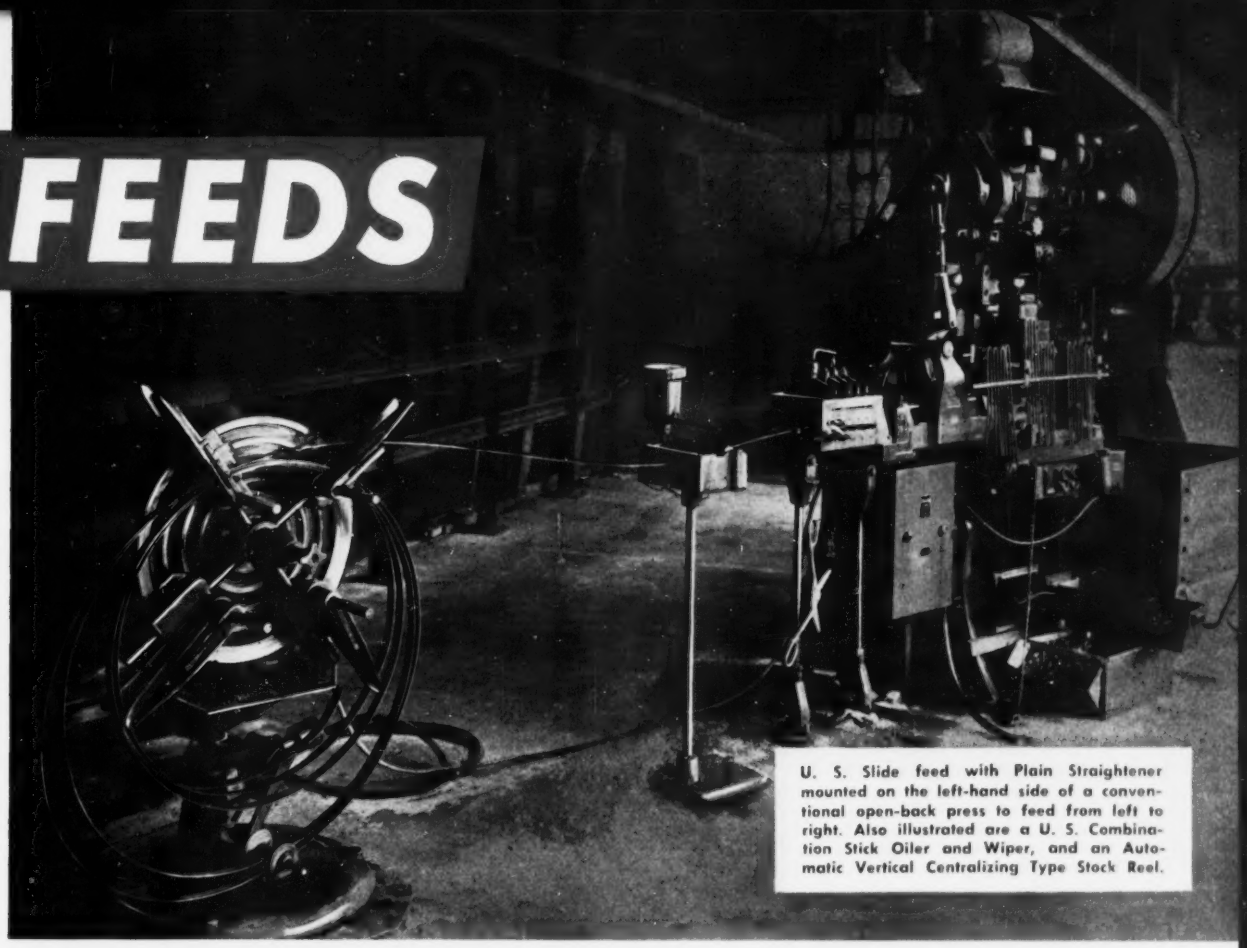


Photo above shows a U. S. Slide Feed with a U. S. Plain Straightener mounted for feeding right to left on a press with crankshaft running from front to back, instead of left to right as on conventional presses. Also shown in photo is a U. S. Automatic Coil Cradle.

Photo at left shows a U. S. Slide Feed arranged with a Two-Way Wire Straightener to feed round wire from front to back into a straight-sided press.

U. S.

FEEDS



U. S. Slide feed with Plain Straightener mounted on the left-hand side of a conventional open-back press to feed from left to right. Also illustrated are a U. S. Combination Stick Oiler and Wiper, and an Automatic Vertical Centralizing Type Stock Reel.

Do These Jobs Suggest Answers to Your Press Feed Problems?

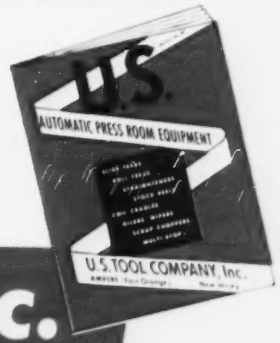
The illustrations on this and the facing page show U. S. Slide Feeds being used with three different types of presses. In each case the user is obtaining benefits as follows:

ACCURACY . . .
U. S. Slide Feeds are generally recognized as the most accurate automatic feeds on the market for feeding material into punch presses. The slide block, which contains the blade to grip the material, reciprocates on hardened and ground slide rods between adjustable stops, insuring controlled accuracy of feed length.

VERSATILITY . . .
As illustrated, U. S. Slide Feeds can be arranged for use with different types of presses for feeding left to right, front to back, back to front, etc. They can also be used for feeding different types of material in coils: steel, brass, copper, aluminum, paper, cardboard, fibre, plastic, etc., and they can be arranged for butt feeding short strips when material is over .030" in thickness and of suitable stiffness.

AUTOMATIC OPERATION . . .
The use of a U. S. Slide Feed converts the press into an automatic machine, resulting in reduced costs and increased production. All the operator has to do is thread and start new coils of material.

If press operations are included in your production, U. S. Slide Feeds may be the answer to your feeding problems. Ask for a copy of Bulletin 80-M, which contains complete specifications.



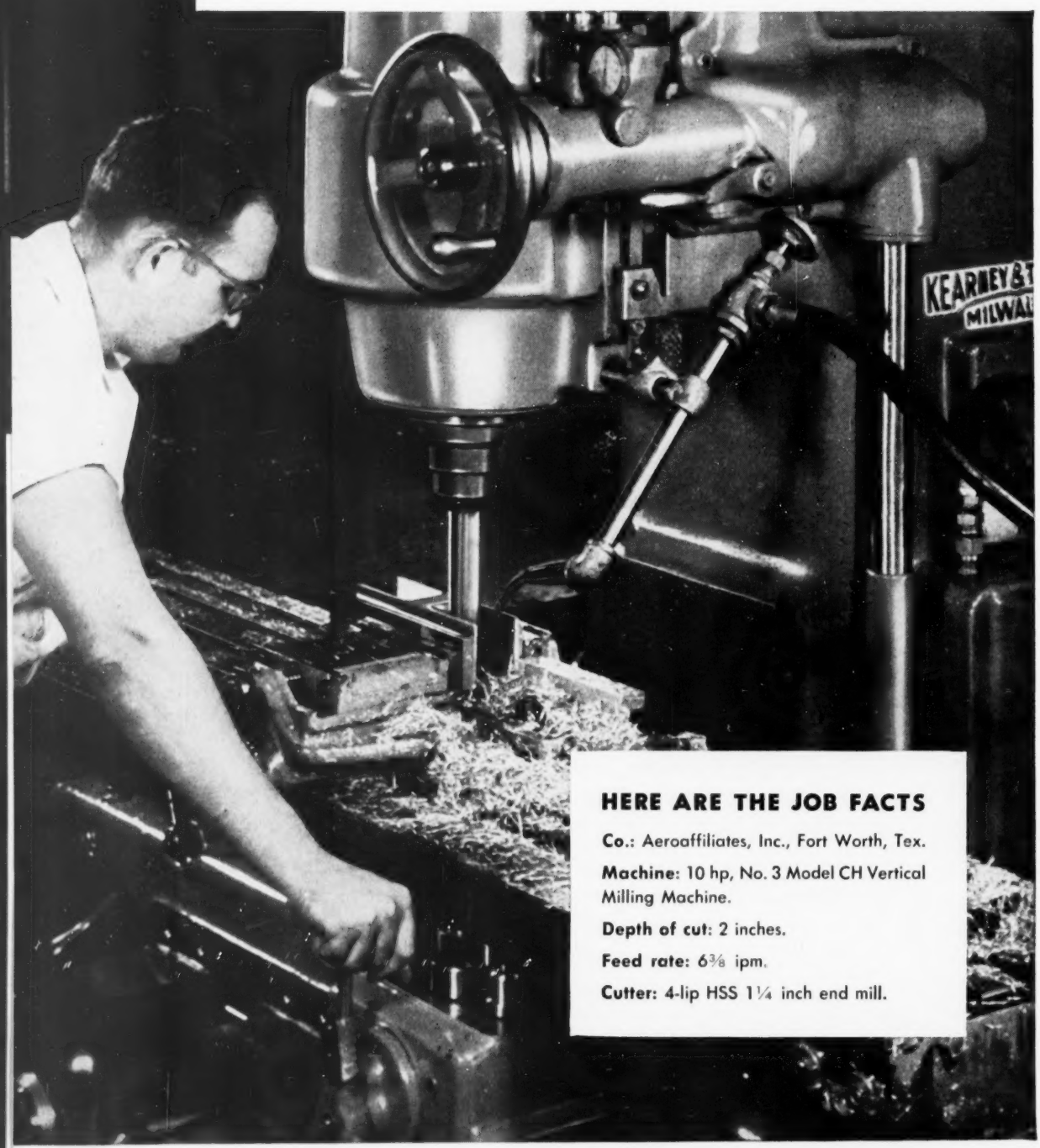
TOOL COMPANY, Inc.

Ampere (East Orange) New Jersey

Builders of U. S. Multi-Slides—U. S. Multi-Mi'lers

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

Load, engage feed there is to it with



HERE ARE THE JOB FACTS

Co.: Aeroaffiliates, Inc., Fort Worth, Tex.

Machine: 10 hp, No. 3 Model CH Vertical Milling Machine.

Depth of cut: 2 inches.

Feed rate: 6⅜ ipm.

Cutter: 4-lip HSS 1¼ inch end mill.

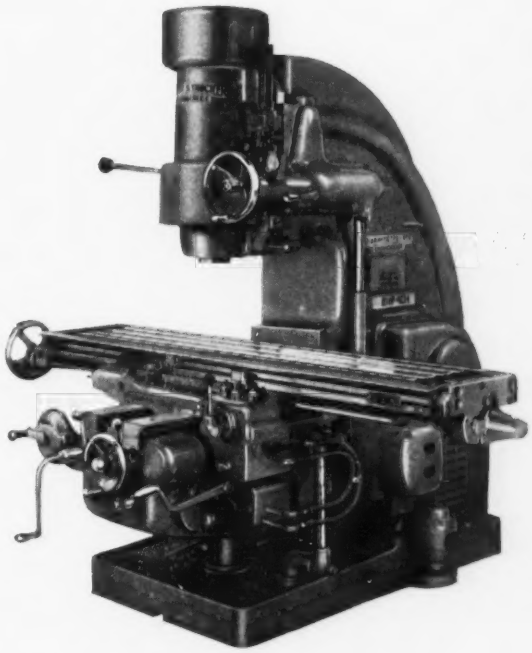
and unload—that's all this CH miller!

Aeroaffiliates of Texas select Kearney & Trecker's 10 hp No. 3 Model CH Vertical Milling Machine with *Mono-Lever and Automatic Cycle Table Control*, to speed up milling of aircraft parts and reduce operator fatigue!

TO finish-mill aluminum vertical beam fittings, this manufacturer put production on an almost automatic basis without sacrificing accuracy. He's handling the job on a 10 hp, No. 3 CH Vertical Milling Machine equipped with Mono-Lever and Automatic Cycle Table Control.

Now, after the original setup, all the operator does is load the machine, engage the feed and unload. Production is up, accuracy is maintained and operating conditions have been greatly improved to the reduction in operator fatigue.

Check this great CH line of machines for yourself. See how you, too, can cut costs, increase productivity, improve safety, get better finished products. Contact our representative or write Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.

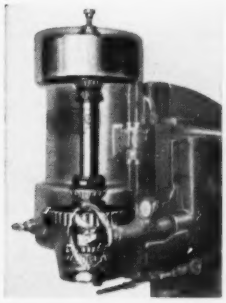


10 hp, No. 3 Model CH Vertical Milling Machine

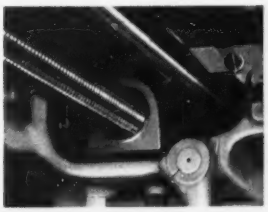
CH Milling Machine features that helped increase output — cut cost per piece



Greater Operating Convenience through Mono-Lever control facility (optional at extra cost) for table feed and rapid traverse. Also, rapid-set micrometer dials — with new vapor blasted, satin finish for greater legibility to avoid setting errors.



Greater Cutting Efficiency through spindle-mounted flywheel, (optional on CH Models) running with three bearing support. On this job it meant fast metal removal and an excellent finish.



Smoother Feed Performance through large dia. heavy-duty table feed screw that affords greater bearing contact, runs through extra-long table feed nut. All models are equipped with backlash eliminator for more effective climb milling, greater accuracy and longer screw life.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS



Once again!...

Jacobs doubles

production rate—gets the

"TOUCH of GOLD"

Leading chuck manufacturer uses Norton machines to cut grinding time in half



When a leader like The Jacobs Manufacturing Company selects equipment, you can be sure that this equipment has had careful study from every angle of performance and cost.

That's why Jacobs' choice of Norton grinding machines is worth serious consideration when *you* are buying grinding machines.

In producing their famous Rubber-Flex Collets, for example, Jacobs reports that switching from separate operations to a single operation on Norton Type CTU Semiautomatics with multi-wheel mounts has doubled their production rate. *Jacobs reported similar production savings in grinding chuck bodies on the same type of Norton machines.*

Another manufacturer has boosted production from 300 to 600 parts per hour by grinding 2 diameters at once on a Norton machine. Still another reports that a Norton grinding machine with a triple-wheel mount has upped his production rate 128%. Throughout industry, manufacturers are using Norton grinders and lappers to provide the "Touch of Gold" that means time, work and money saved in grinding operations.

The "Touch of Gold" in Your Own Grinding

means the same profit-increasing advantages. And remember: only Norton offers you such long experience in both grinding wheels and machines to assure this "Touch of Gold" that helps you produce more at lower cost.

For further facts, see your Norton Representative, or write us direct. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize With NEW

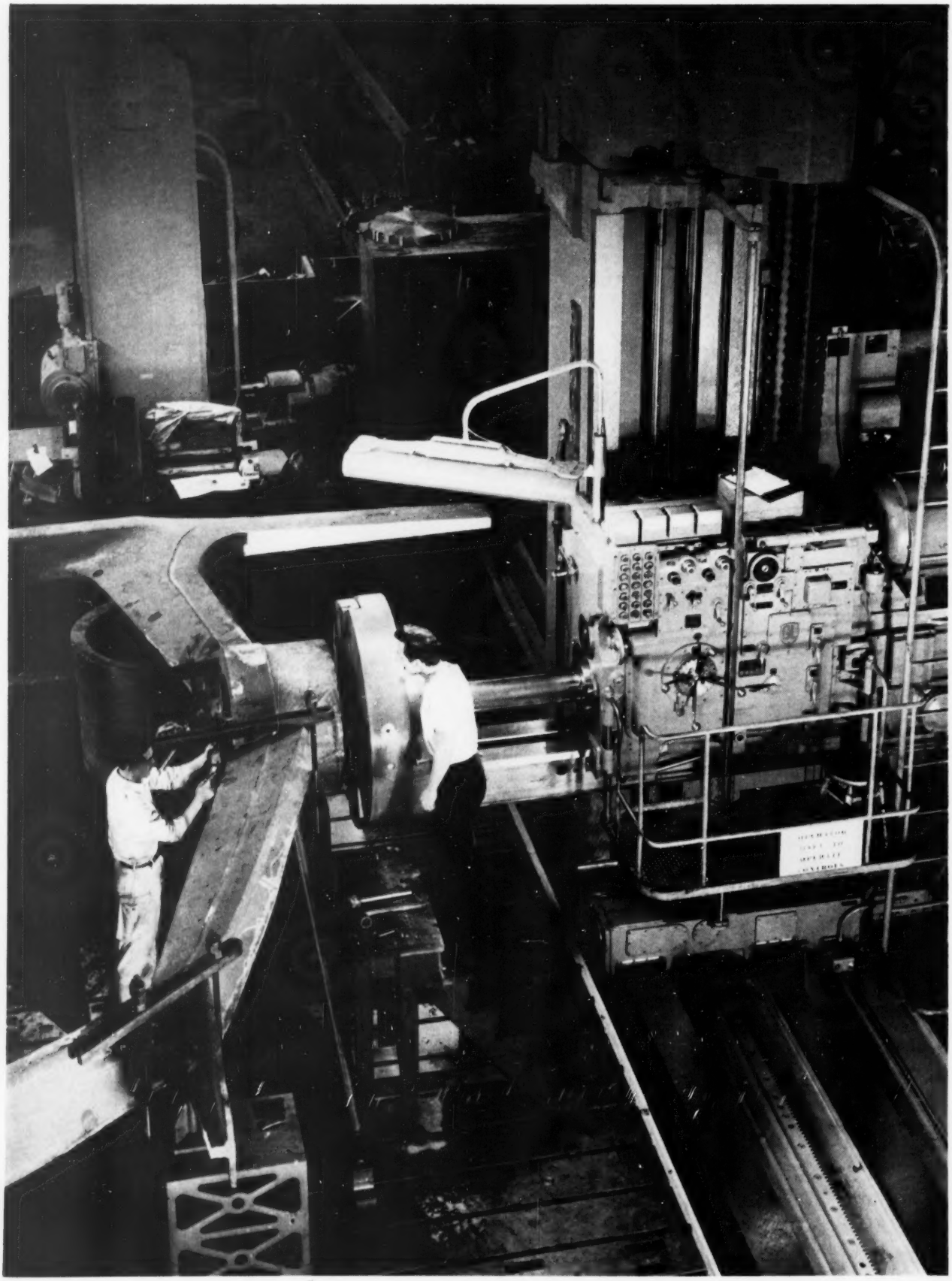
NORTON

GRINDERS and LAPPERS

Making better products... to make other products better

District Sales Offices: West Hartford • New York (Teterboro, N. J.) Cleveland • Chicago • Detroit

The "Touch of Gold" at Jacobs. One of the Norton 6" Type CTU Semiautomatic Grinding Machines used by The Jacobs Manufacturing Company of West Hartford, Connecticut, to grind metal inserts in the famous Rubber-Flex Collets. The basically fast action of this Norton grinder, the multi-wheel mount, special swivel table arrangement and wheel-truing device provide a single setup for traverse and shoulder grinding operations that boosts production rate 100%.





Machinist's mate... large economy size!

Here's a machine tool that's got everything—versatility, capacity, speed, power and precision. On it, a master machinist can do practically anything. It's a heavy-duty, G&L 50 Series Horizontal Boring, Drilling and Milling Machine

Here's a superb machine that skilled machinists dream of working with. You can bore, drill or mill with equally high efficiency no matter what the workpiece . . . large or small, simple or complex.

Smooth, versatile and powerful . . . it's a machine that performs multiple operations from a single setup. Extremely rigid, with over 100 speeds and an unusually wide range of feeds, a 50 Series machine simplifies every job. And it's built to maintain its new machine accuracy for many years to come.

Quality-built to the most exacting standards, G&L 50 Series machines are available in table, floor and planer types . . . with runways, columns and tables to meet any practical requirement. For complete details, see your G&L representative or write for Catalog and Bulletin N-1.

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools — Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines, Vertical Boring Mills; and Davis Cutting Tools

Photo courtesy of National Supply Co., Torrance, Calif., shows 50 Series Floor type machine boring and facing the stern propeller shaft housing in the skeg casting for an ocean-going freighter.



The Old Fashioned Plug Is Out Moded In This Fast-Rolling MODERN Age

Users everywhere say:

DuBo* *is the MODERN* Plug Gage

*U.S. and Foreign Patents Granted



Gaging Surfaces are Portions of a Sphere

Operates by Tilting Handle

Whether handle will drop freely or not is the definite yes-or-no indication. No guesswork, no forcing, no fumbling!



COLOR Gives INSTANTANEOUS "FOOL-PROOF" INDICATION of GO and NO GO

For Quality Control

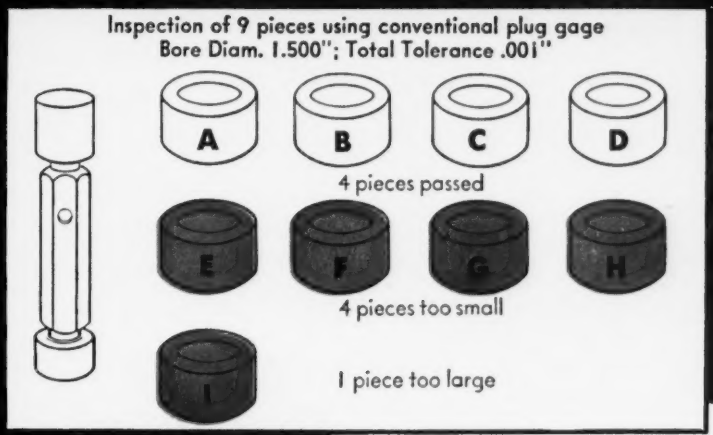
NO plug gage can equal DuBo

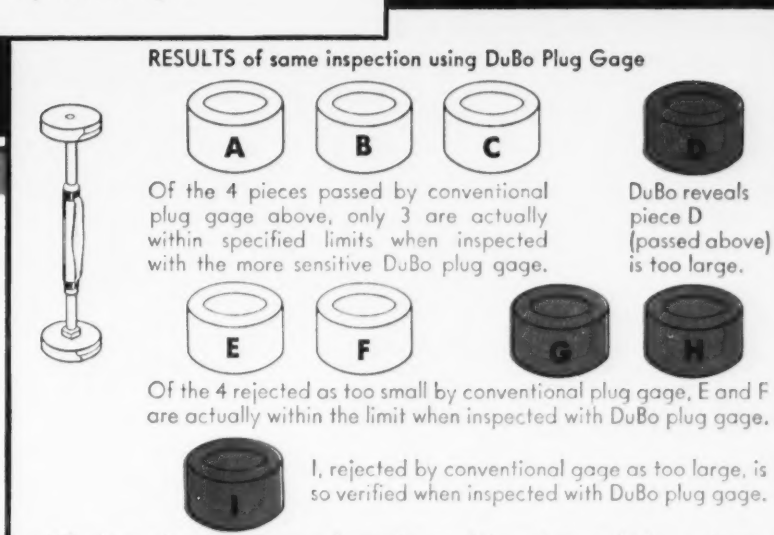
- . . . IN ACCURACY
- . . . IN EASE OF HANDLING
- . . . IN SENSITIVITY
- . . . IN LIGHT WEIGHT
- . . . IN LONG TERM SERVICE
- . . . IN COST SAVING AND PROFIT

Like so many items of modern design, DuBo Plug Gage *looks* different and *feels* different from the conventional plug gage. And even craftsmen of the old school, used to time-worn methods, quickly get the feel and take pride in the use of this *different* tool. *Added to that are the many actual cases where DuBo, after a fair trial, has replaced conventional plug gages.*

With exceptional ease of handling, DuBo gives a precise, definite and sensitive check of bore diameters, directly and with no element of confusion, even in unskilled hands. In the same application, DuBo reveals dimensional variations such as taper and out-of-round which ordinary plug gages cannot indicate.

An ABC Demonstration of DuBo* Plug Gage Superiority





COST-SAVING FACTORS

DuBo Plug Gages outlast ordinary plugs many times. Extremely light in weight (in the larger sizes, 70% to 80% lighter than cylindrical plug gages of equivalent diameter) and requiring no jockeying into position for entry, DuBo effects economies in that important cost item, actual inspection time.

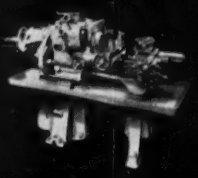
Use DuBo for Precision Plug Economy

When inspecting parts under quality control sampling procedure, it is important that those parts which may be close to either end of the tolerance range be properly classified. The definiteness and simplicity of DuBo gaging is a decided advantage in this type of inspection. Anyone who has tried to enter a cylindrical plug into a hole only .0001" larger than the gage, knows how difficult it is. For even skillful workers there is a point at which it becomes doubtful whether the bore is actually smaller than the gage size, or if it is larger and merely close. With DuBo Plug Gage, even an unskilled worker can easily enter the gage under any condition and quickly interpret bore conditions correctly. There need be no border-line cases of doubt regarding the proper classification of a bore. Use of the DuBo Plug Gage minimizes the cost of parts needlessly rejected and the expense accruing from those incorrectly passed.

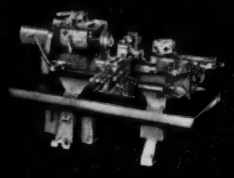
TRY DuBo! Sense its craftsmanlike feel and balance. See how easily it enters, even in undersize bores . . . how gentle manipulation of the handle accurately reveals internal conditions. Use it on a *fussy* job and you'll KNOW why DuBo is replacing old time plug gages everywhere! Refer to Catalog C, Pages 18, 19, 20, 21. Or, write or phone for more detailed information.

STANDARD Gage Co., Inc.
POUGHKEEPSIE, N.Y.

TURRET LATHES | **RAM TYPE ▸ ▾SADDLE TYPE**



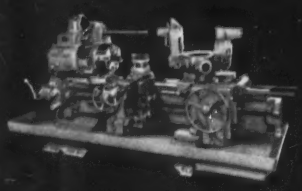
NO. 2 ALL-GEARED HEAD
1" Bar Capacity—14" Swing



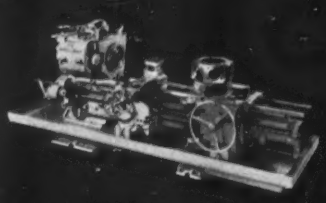
NO. 3 UNIVERSAL
1½" Bar Capacity—15⅜" Swing



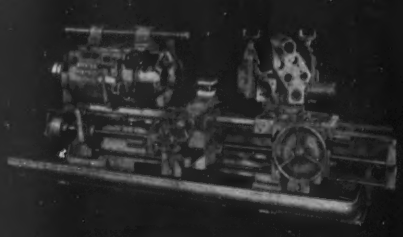
1-A UNIVERSAL HEAVY DUTY
2½" or 3" Bar Capacity—16¼" Swing



2-A UNIVERSAL HEAVY DUTY
3½" Bar Capacity—20" Swing



3-A UNIVERSAL HEAVY DUTY
4½" or 6" Bar Capacity—23½" Swing



4-A UNIVERSAL HEAVY DUTY
8", 9" or 12" Bar Capacity—28¼" Swing



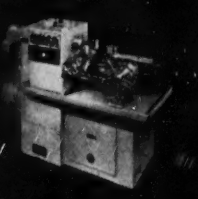
Get the competitive edge for the years ahead...

by planning a continuing modernization program

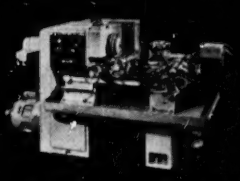
Look to the company that is constantly analyzing modern trends in metalworking to better fulfill the needs of industry by developing new types and sizes of machines — extending its Sales Engineering facilities to be of even greater service.

Look to your Warner & Swasey Field Engineer as your "turning specialist". He can help you select the right machine, and will continue to *share your interest* in its performance in the years ahead.

ELECTRO-CYCLES



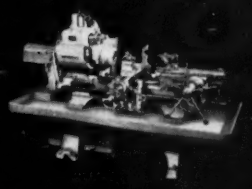
NO. 1 ELECTRO-CYCLE
⅝" Bar Capacity—11" Swing



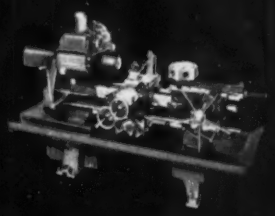
NO. 2 ELECTRO-CYCLE
1" Bar Capacity—14" Swing

YOU CAN TURN IT BETTER, FASTER, FOR LESS WITH WARNER

PRECISION TAPPING AND THREADING MACHINES



NO. 4 UNIVERSAL
2" Bar Capacity—18⅛" Swing

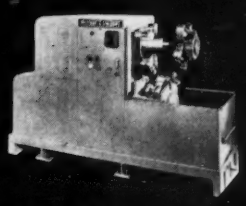


NO. 5 UNIVERSAL
2½" Bar Capacity—20" Swing

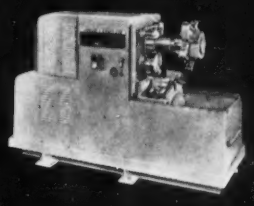


NO. 10 TAPPING MACHINE
0-80 to 10-24 Capacity

SINGLE SPINDLE AUTOMATICS



1 AC CHUCKING MACHINE
8" or 10" Chuck—6" Working Stroke

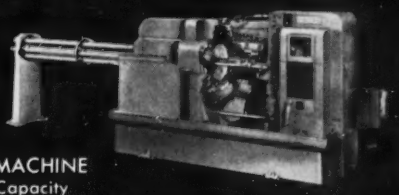


2 AC CHUCKING MACHINE
10" or 12" Chuck—9" Working Stroke

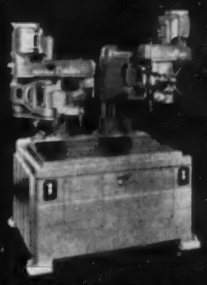


NO. 11 TAPPING MACHINE
8-36 to ⅞" Capacity

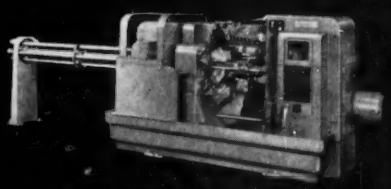
MULTI-SPINDLE AUTOMATICS



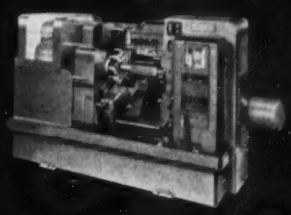
6-SPINDLE BAR MACHINE
¾" or 1¼" Bar Capacity



NO. 11 RS RADIAL (Single Head)
NO. 11 RD RADIAL (Double Head)
8-36 to ⅞" Capacity



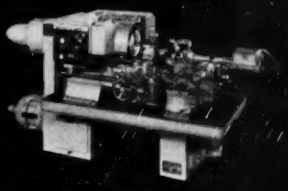
5-SPINDLE BAR MACHINE
1¾" Standard Bar Capacity
2¼" Oversize Capacity



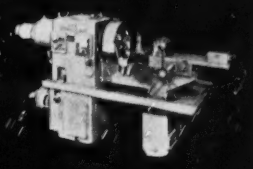
5-SPINDLE CHUCKING MACHINE
6" Swing

NO. 12 TAPPING MACHINE
⅜" to 2½" Capacity





NO. 3 ELECTRO-CYCLE
1½" Bar Capacity—15⅞" Swing



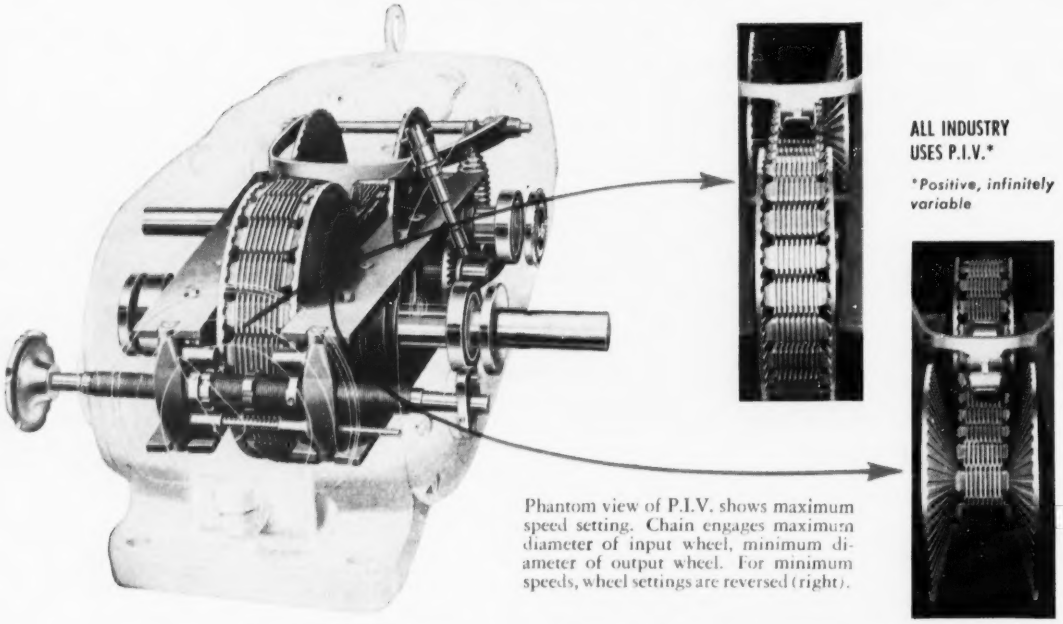
16" ELECTRO-CYCLE
1½" Bar Capacity—16⅞" Swing

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

& SWASEY TURRET LATHES, AUTOMATICS, TAPPING MACHINES

How you can get speed changing that's

truly POSITIVE truly STEPLESS



Phantom view of P.I.V. shows maximum speed setting. Chain engages maximum diameter of input wheel, minimum diameter of output wheel. For minimum speeds, wheel settings are reversed (right).

ALL INDUSTRY USES P.I.V.*

**Positive, infinitely variable*

LINK-BELT's P.I.V. operates independent of friction ... gives you exact selection of an infinite number of speeds

TURN a hand wheel . . . push a button . . . or utilize fully-automatic controls. Link-Belt's P.I.V. Variable Speed Drive provides the speed you need—without stopping the machine. Speed changing is positive, stepless—accurate under full load. Speed choice is infinitely selective, effortless and precise.

P.I.V. is not dependent on friction for power transmission. Link-Belt's exclusive self-tooth-forming chain meshes with grooved wheels to assure positive power transmission at all speeds. Full-rated horsepower is constantly delivered to your machines.

If your manufacturing processes demand variable speed control, get all the facts about these compact P.I.V. Variable Speed Drives. There's an experienced power transmission engineer in the Link-Belt office near you. Call him today. Send for Catalog No. 2274.

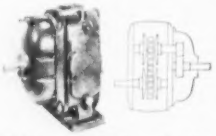
LINK-BELT P.I.V. VARIABLE SPEED DRIVE

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities. 13,117

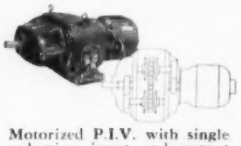
4 of 16 P.I.V. types you can choose from. ½ to 25 hp . . . ratios to 6:1



Basic P.I.V. Like all others, it is built for horizontal or vertical mounting.



P.I.V. with single reduction input or output helical gears.



Motorized P.I.V. with single reduction input and output helical gears.

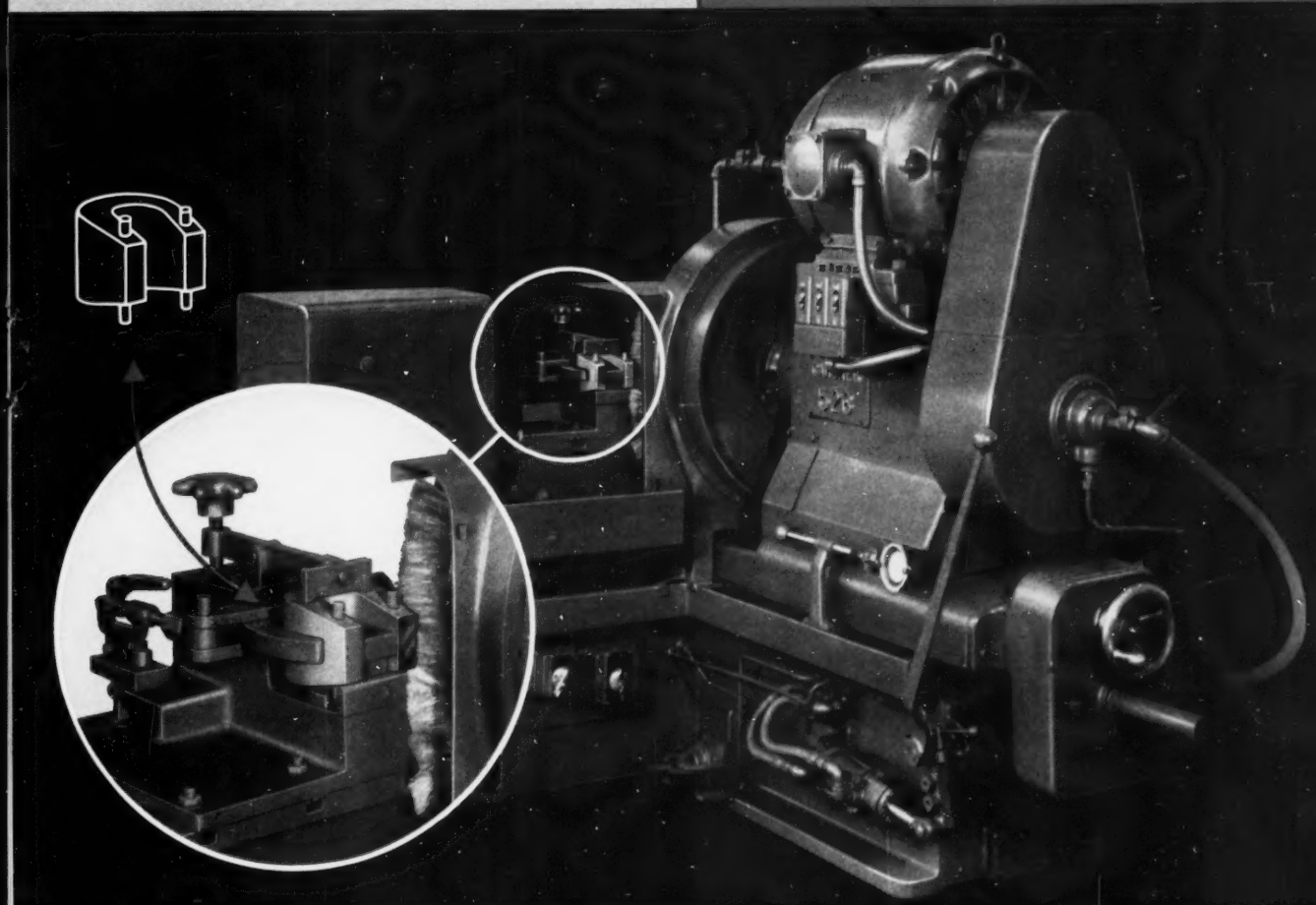


Motorized P.I.V. with single reduction input and double reduction output helical gears.

For more information on products advertised, use Inquiry Card, page 247

This 26" Single Spindle Grinder with hydraulic table finishes the poles of large U-shaped Alnico magnets in half the time of the surface grinding method formerly employed.

Gardner Grinding Doubles Production



No. 127M

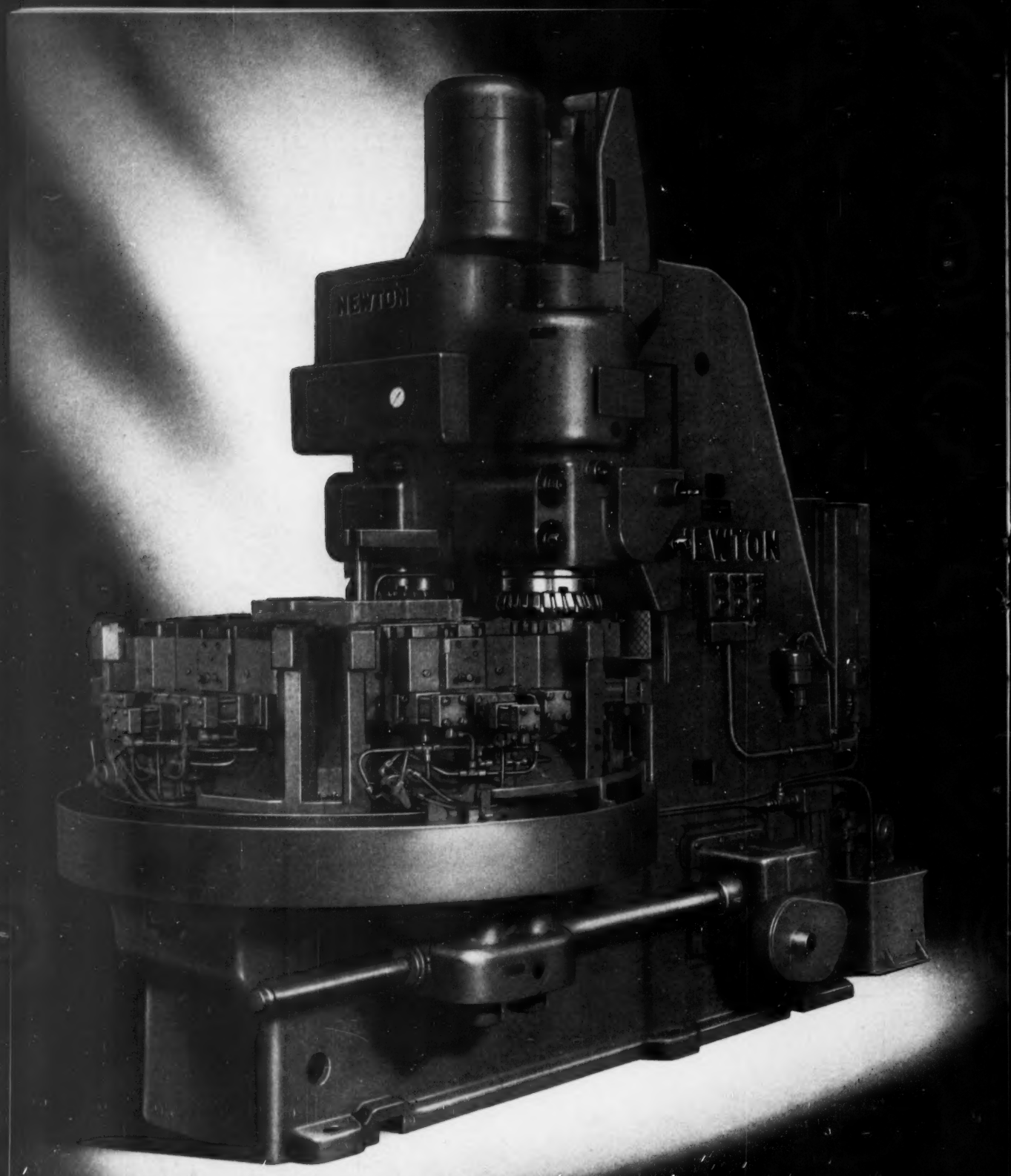
WORK DATA

MACHINE	Gardner No. 526—26" Single Spindle Grinder
TOOLING	Hydraulically-operated work table with hand clamping fixture
PART	Alnico horseshoe magnet with 5 sq. in. pole area
STOCK REMOVAL	Up to 1/16"
TOLERANCES	.0005" to .001" for flatness .010" for uniformity
PRODUCTION	25 magnets per hour

GARDNER MACHINE COMPANY
414 Gardner St., Beloit, Wisconsin, U.S.A.

GARDNER

precision disc **Grinders**



CONSOLIDATED MACHINE TOOL

Wholly owned subsidiary of Farrel-

For milling the flat surfaces of repetitive pieces, there is no faster known method than continuous rotary milling!



Newton 48" Continuous Vertical Rotary Milling Machine with hydraulic fixtures that automatically clamp and unclamp as the table turns.

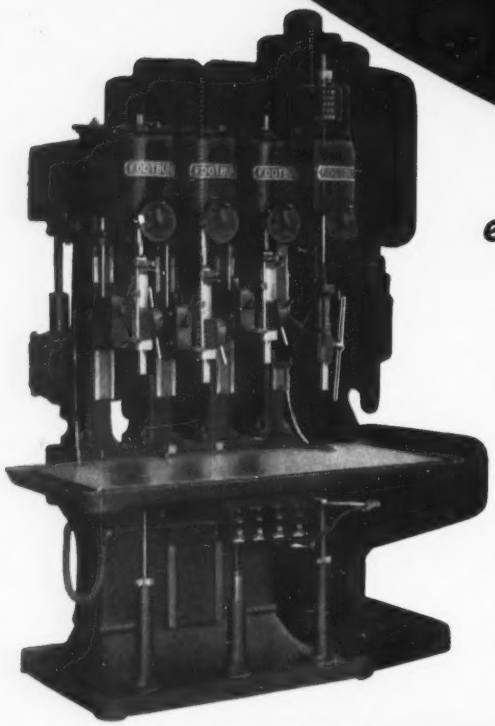
CORPORATION, ROCHESTER, N. Y.

Birmingham Company, Incorporated.

FOOTBURT

faster...

for tool room or assembly line



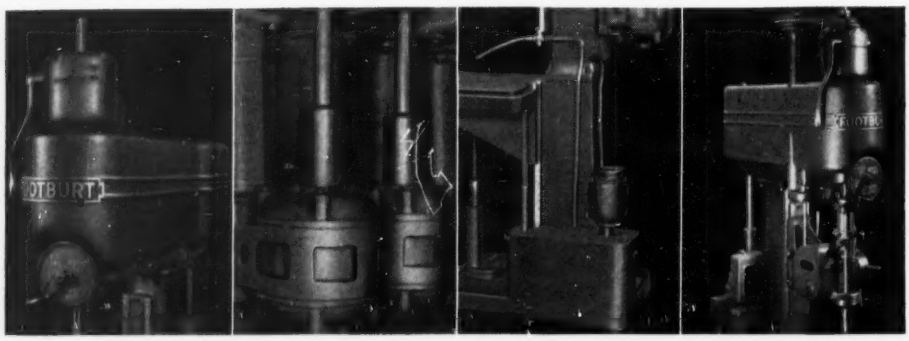
engineered for production

The choice of fine machine tools now will help you meet those new production schedules. Footburt Sensatives are built with the wide range of speeds and with power and sturdiness to drive cutting tools to their full capacity. They are built with the care and precision that will keep them accurate over a long period. Write, wire or phone for prices and delivery information.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

No. 2 Machine with Back Gear • 12" Overhang • ⅝" Drilling Capacity in Steel • Optional Speed Ranges • 185 to 2300 RPM • 280 to 3450 RPM • Vertical Motor Drive with Standard Single Speed Motor • Power Feed Assembly • Tapping Attachment • Coolant Outfit.

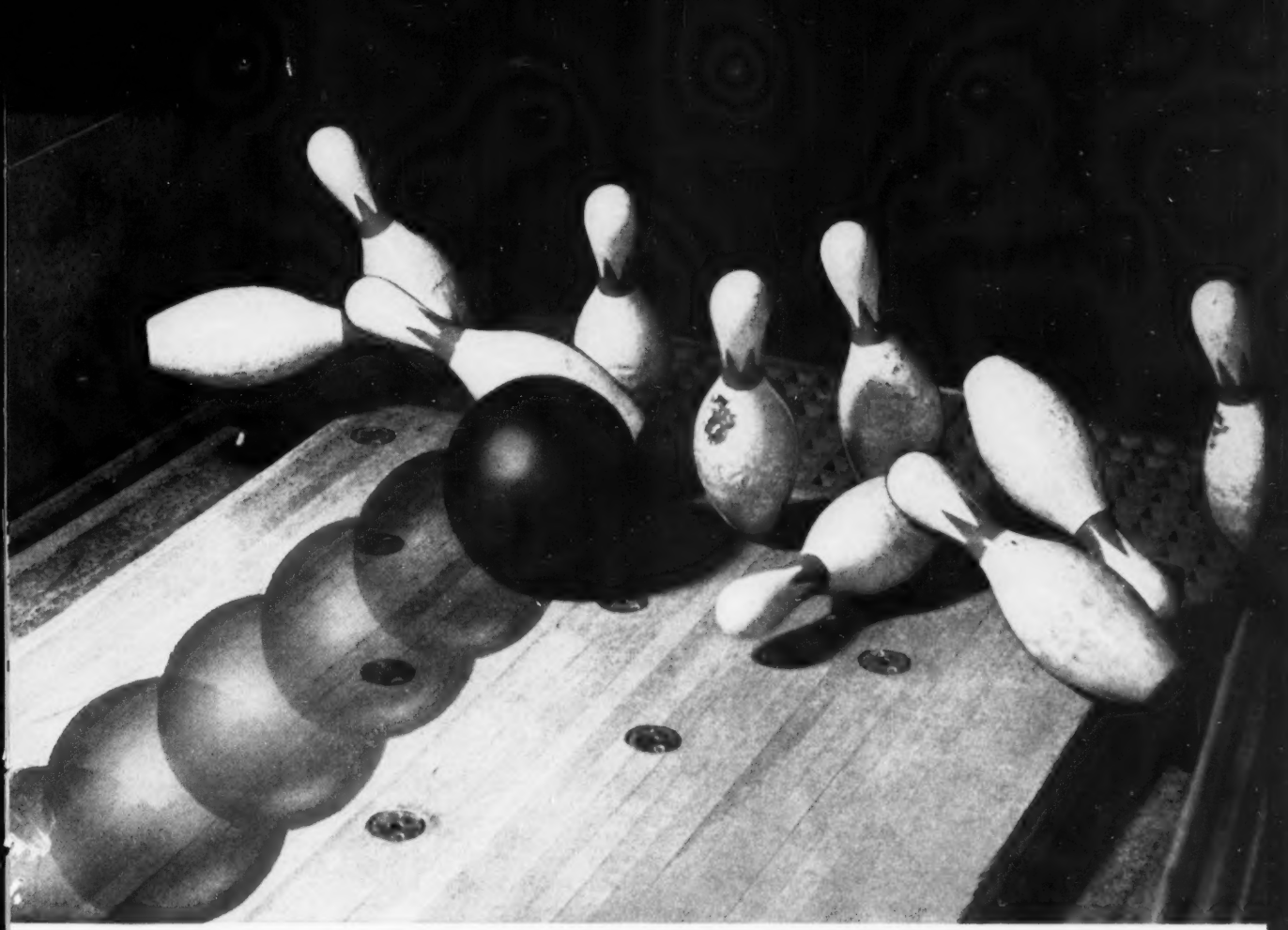


engineered for production

FOOTBURT

MACHINE TOOLS

For more information on products advertised, use Inquiry Card, page 247



What's the **score** in **your shop**?

You're bound to be way out ahead—with a "ten-strike" in every frame—if your cutting fluid is CIMCOOL°. Because this radically new and different coolant *covers 85% of all metal cutting jobs . . . and does a better job.*

Naturally Cimcool puts you in the winning column. It's a *chemical emulsion.* Cimcool replaces all water emulsions and all but a few highly compounded specialty oils. It permits faster speeds and increases tool life because it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants. It's longer lasting in machines. So Cimcool reduces downtime and cuts labor costs for cleaning and changing.

Frankly, we're sure that *you'll* be bowled over when you see what Cimcool can do for you. For a demonstration, just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio

°Trade Mark Reg. U.S. Pat. Off.



CIMCOOL

for 85%
of all metal cutting jobs

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.



aids

TO MODERN FORGING PRACTICE



YOU ARE INVITED to have your name placed on our mailing list to receive this valuable series of articles on up-to-date forging methods. We will be glad to send a complete set of all eleven issues of "The Forger" in addition to placing your name on our mailing list to receive future issues as they are prepared. There is absolutely no charge for this service. We are glad to make this gesture towards the advancement of modern forging practice as executed on ACME XN Forging Machines.

THE HILL ACME COMPANY

ACME MACHINERY DIVISION • **1203 W. 65th St., Cleveland 2, Ohio**
ESTABLISHED 1882

"ACME" FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" GRINDING AND POLISHING MACHINES
HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

For more information on products advertised, use Inquiry Card, page 247

Production Pointers from GISHOLT

GISHOLT TIME-SAVING IDEAS



Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help you cut time and costs in your own work.

FOUND: A FAR BETTER SURFACE FINISH FOR VITAL TRANSMISSION PARTS

Superfinish Does the Job in One High-Speed, Automatic Operation

The demand for automatic transmissions in today's automobiles poses new problems in the machining and surface finishing of vital parts. Take this sun gear shaft: four separate bearing surfaces require ultra-fine finish to assure maximum life.

Superfinish proved to be the solution. A standard Model 51-A Superfinisher was modified for the job. Four quills, each with its own stoneholder and stones, were added along with a special workholder and driver.

MEETS ALL 3 REQUIREMENTS

Accuracy: All four surfaces are done at once—Superfinished down to 5 micro-inches from a 15 micro-inch grind. With the automatic cycle, there is precisely the same stock removal and surface finish time after time.



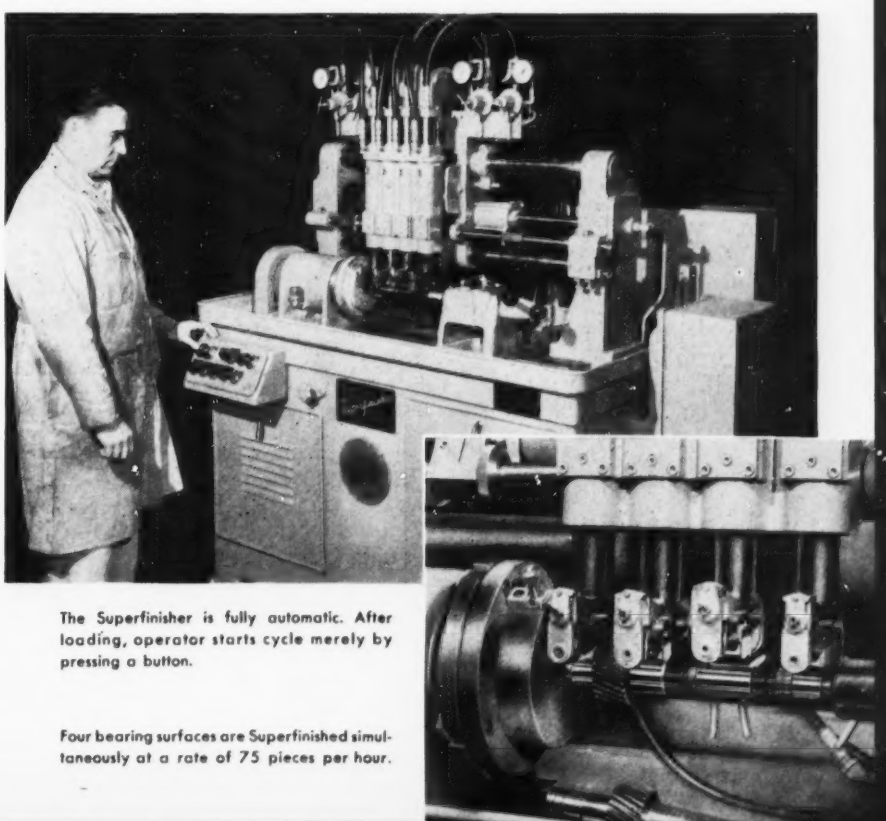
FACTS ON TWENTY JOBS—with photos and complete information are given in this brand-new Superfinish Catalog, just printed. The many typical applications will show how Superfinish can help you—in achieving better quality surface at low costs. Write for your copy today.

Superfinish rids the bearing surfaces of all annealed "smear metal" and grinding flats. Surfaces are true base metal, assuring absolute maximum bearing life.

High-Speed Output: The single Superfinisher produces 75 completed shafts per hour at 85% efficiency.

Low Costs: With the low machine investment and the fast automatic operation of the Superfinisher, production costs are very low. Because Superfinishing takes the place of a final grinding operation, costs are actually lower—yet surface finish is far better and longer lasting.

Here, with both low machine investment and low production costs, vital transmission parts get far better, smoother, longer lasting surfaces.



The Superfinisher is fully automatic. After loading, operator starts cycle merely by pressing a button.

Four bearing surfaces are Superfinished simultaneously at a rate of 75 pieces per hour.

GISHOLT

TIME-SAVING IDEAS

WORKING ALL ANGLES TO CUT COSTS ON DRILL BIT BLANKS

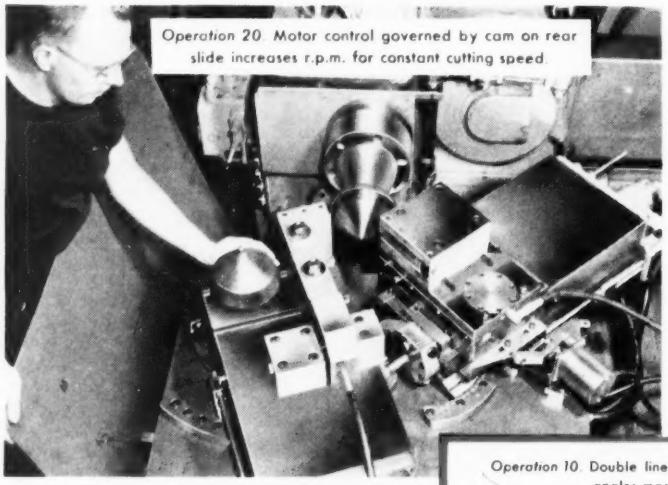
No. 12 Hydraulic Lathes Adjust Quickly for Many Different Parts and Angles

The question to be answered by this producer was how to most efficiently machine similar parts having dissimilar angles . . . and get easy changeover to other sizes. The workpieces are hard steel cone blanks; the finished products are oil well drill bits.

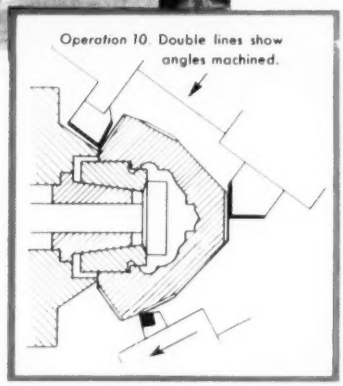
Because of the variety of sizes involved with each type having multiple angles, the practical solution was a pair of No. 12 Hydraulic Automatic Lathes. These are operated by one man. Changeover is simple with tool slides mounted on swivel bases.

A typical setup for operation 10 is shown in the tooling layout. Both front and rear slides can be adjusted to the required angles. The work on this 6½" cone takes less than a minute and a half, f.t.f.

Operation 20 is shown in the photo. Again the front and rear slides are mounted on swivel bases. The rear slide turns the long cone, and a special motor control speeds up the spindle to give a nearly constant cutting speed as the tool approaches the cone point. A fine finish and excellent tool life is the result. The front slide turns in the conventional manner. Floor-to-floor time is just over a minute.



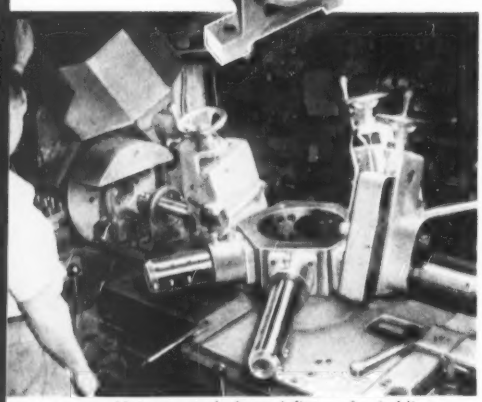
Operation 20. Motor control governed by cam on rear slide increases r.p.m. for constant cutting speed.



Operation 10. Double lines show angles machined.

Having slides that pivot is a big time saver in changeover of the No. 12 Hydraulic Automatic Lathes to other parts with different angles.

HOW THIS AWKWARD PART IS MACHINED WITH EASE



Note counterbalanced fixture for holding awkward part.

Unusual Job Efficiently Handled on Turret Lathe

How to handle this awkward, unbalanced part on a general-purpose turret lathe? Good planning and a 2L Saddle Type Turret Lathe provided the solution.

A special angle plate fixture with locating feet was built to hold the long rotor shaft housing. This eliminates chucking strain and insures that both bores will be round, concentric and in line. The counterweighted fixture is dynamically balanced with the workpiece to permit the high spindle speeds required for volume output and proper finish.

Tools are simple. Vertical slide tools handle all recessing, and boring bars take care of the two diameters. Time is 8.6 minutes floor-to-floor. Changeover for other size housings is simple.

★ ★ ★ ★ ★ ★ ★ ★

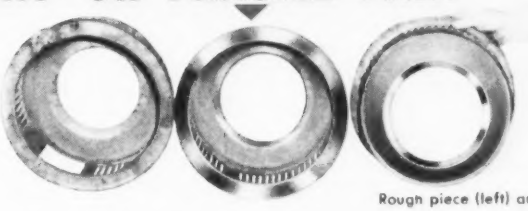
Doing boring and recessing on this clumsy part is a simple operation on the saddle type lathe with special holding fixture.

GISHOLT

TIME-SAVING IDEAS

GETTING A FIRM GRIP ON FRAGILE PART

Fastermatic Sets Fast Pace on Light Frame



Rough piece (left) and finished parts.

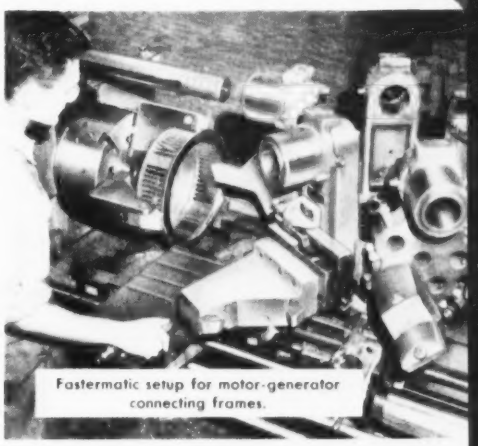
Thin-wall parts are usually a problem. But, in this case, the job is doubly tough because the workpiece is a welded assembly and has an open frame. Bores must be concentric and the faces parallel.

Devising a holding fixture was a routine matter, with Gisholt's long experience as a builder of lathes and chucks providing a "stock answer." A standard 15" 3-jaw air chuck assures speedy operation and controlled chucking pressure. Extended jaws permit pressure to be applied by rocker-type jaw ends on the front and back rings. This centers the workpiece and equalizes pressure at all points, avoiding distortion.

A 2F Fastermatic Automatic Turret Lathe handles the job. To avoid possible distortion from excessive stock removal, rough and finish cuts are made on both bores and faces. Special long tool holders carry tool bits for simultaneously machining the front and back surfaces.

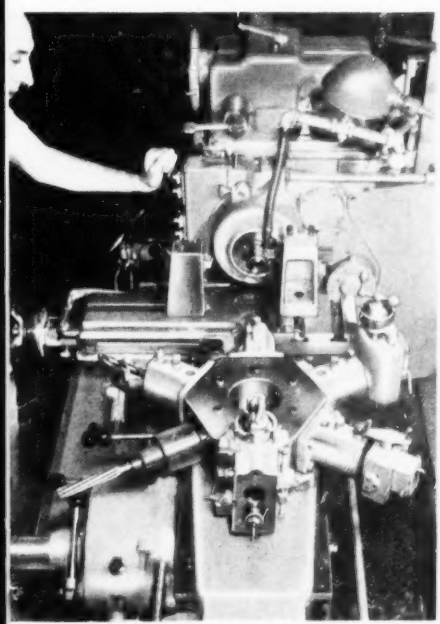
The job is completed in the excellent time of only 5.5 minutes—with the automatic cycle of the Fastermatic enabling the operator to run other machines.

Fragile parts are quickly produced with repetitive accuracy, thanks to well-planned chucking and the automatic cycle of the Fastermatic.



Fastermatic setup for motor-generator connecting frames.

BUSINESS-LIKE SETUP FOR MACHINING BUSHINGS ON TURRET LATHE



Setup for efficient machining of stainless steel bushings.

Ram Type Machine Has Standard Hydraulically Actuated Collet Chuck and Bar Feed

Here's a fast, simple, low-cost way for machining 1¼" ring seal bushings. The job is done in a single operation on a No. 4 Ram Type Turret Lathe.

To start, the stainless steel bar stock is advanced through the spindle and held in the collet chuck. Both movement and clamping are hydraulically actuated—saving both time and effort.

The first station on the hexagon turret is a stock stop. The next two stations are used for conventional drilling and reaming. A vertical slide tool, seen in the foreground of the photo, carries a hook cutter and catches the first recess in the bore. The turning of the straight OD from the cross slide is then combined with the five-degree chamfer from the hexagon turret. The second recess in the bore is formed from the sixth station. Cut-off tool at rear of cross slide completes the operation.



Well-planned tooling with the advance and clamping of bar stock hydraulically controlled saves time and effort on this Ram Type Turret Lathe job.

GISHOLT

TIME-SAVING IDEAS

MASSIVE FLYWHEELS BALANCED FOR SMOOTH OPERATION

Direct Readings Show Unbalance Correction Required

The huge part you see here is a non-magnetic inertia flywheel for Navy Minesweepers. The problem is to make them smooth and quiet in operation. This means precision balancing which is readily done on a Gisholt DYNETRIC Floor Type Balancing Machine.

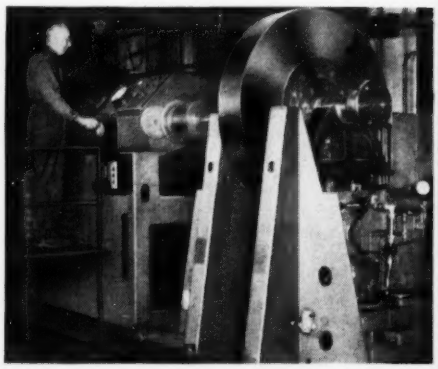
The flywheel assemblies weigh 5,200 lb. and measure 50" in diameter. Although the dynamic correction planes are only 9½" apart, the flywheels are easily balanced to less than 1 ounce inch in each plane. Correction for unbalance is made by grinding on the outer rim.

The flywheel is balanced on its own shafts and supported on its own bearings. Heavy oil pressure to the half bearings eliminates metal to metal contact and protects the arbor journals. Other rotating parts of the engines are also balanced to fine tolerances, assuring quiet, smooth operation of the final assembly.

Whether your problem is balancing large parts like these . . . or components weighing only ounces, there is the right Gisholt Balancer for the job.

"Floating" these heavy parts on pressurized half bearings not only protects the bearing journals, but facilitates precision balancing as well.

DYNETRIC BALANCERS

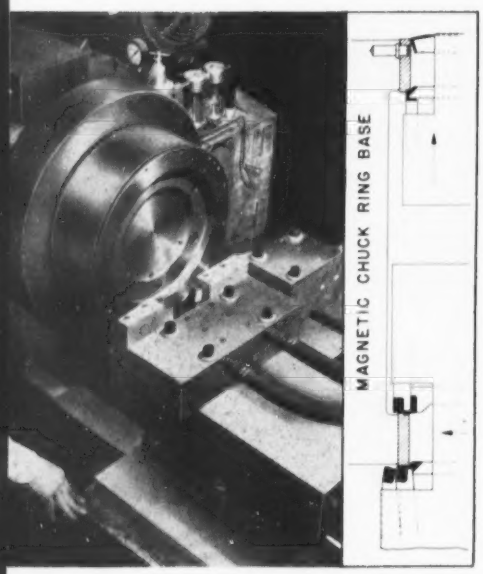


PRODUCTION BALANCING . . .

is only one of the many helpful subjects covered in the Gisholt Balancing School —only service of its kind available to industry. Ask for details.

HOW TO HOLD CRITICAL DIAMETERS ON LARGE, THIN PARTS

Standard Simplimatic with Special Chucking is the Answer



Tooling setup on two slides.

The workpiece is a flywheel cover plate. It's a difficult part, both to hold and machine.

Here's how the job is done:

Because of the thin-wall and wide diameter of the workpiece, a magnetic chuck with a ring base and locating pins is used. With the slightly smaller size of the base, the turning and boring tools have clearance to pass through the work.

For concentricity of the OD and ID, they are machined simultaneously —rough, finish and chamfer the OD; bore and counterbore the ID. Five tools mounted in a single tool block on the front slide handle this work while three tools on the rear slide move across to face, chamfer and groove the ID.

Time is an even 3 minutes floor-to-floor, showing the efficient setups you can have with the Simplimatic Automatic Lathe.

Smart chucking and simultaneous machining of the ID and OD aid greatly in achieving speed and accuracy on these delicate parts.

Many interesting jobs and tooling illustrations are shown in the helpful Simplimatic catalog. Ask for Bulletin 1159.

No. 1-254
615

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.



GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

New!

VARY-TALLY

Multiple-Unit Reset Counter



DESIGNED TO COUNT ANYTHING COUNTABLE

this new Vary-Tally can be supplied in any combination up to 6 banks high, 12 units wide, with the counting units arranged compactly on stands in tiers. Now check these special features of Veeder-Root design and construction:

- Easily Readable from any Angle . . . Bold Figures Always Centered in Window . . . No Glare . . . Figures not Covered by Fingers in Operation
- Easily Portable, yet Ruggedly Built for Long Wear
- Separate Counting Units Can be Rotated like Tires on a Car, to Distribute Wear Evenly
- All Parts Corrosion-Resistant
- Working Parts of Hardened Steel
- Operation Not Affected by Extreme Heat or Cold
- Individual Tag Above Each Counter-Window — Not Strip Tabs
- Veeder-Root Quality in Every Part

Now what's on *your* mind, that Vary-Tally can help you count? Write for news sheet and prices.

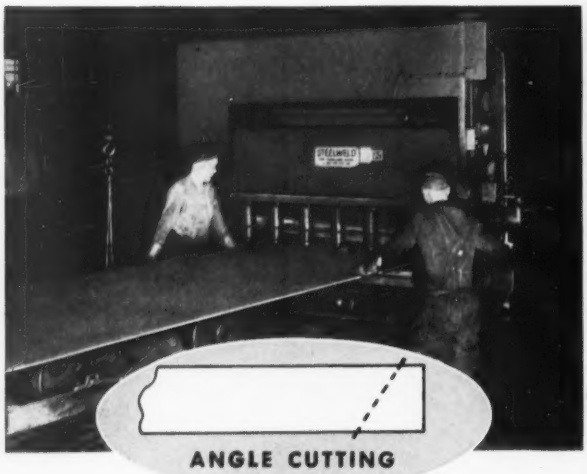
"The Name that Counts"

VEEDER-ROOT INC.

HARTFORD 2, CONNECTICUT

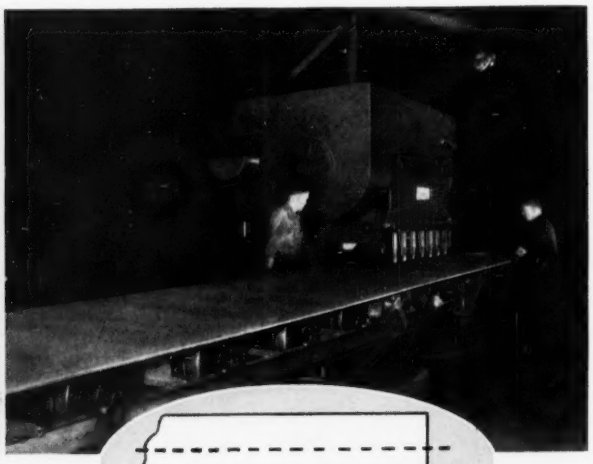
Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C. • Montreal 2, Canada • Dundee, Scotland • Offices and Agents in Principal Cities

Here's a **VERSATILE SHEAR** that *Speeds Production*



ANGLE CUTTING

Because of the deep throat in end housings, larger size sheets or plate can be cut at various angles than possible with most shears. This is also a great advantage when notching and slitting.



SLITTING

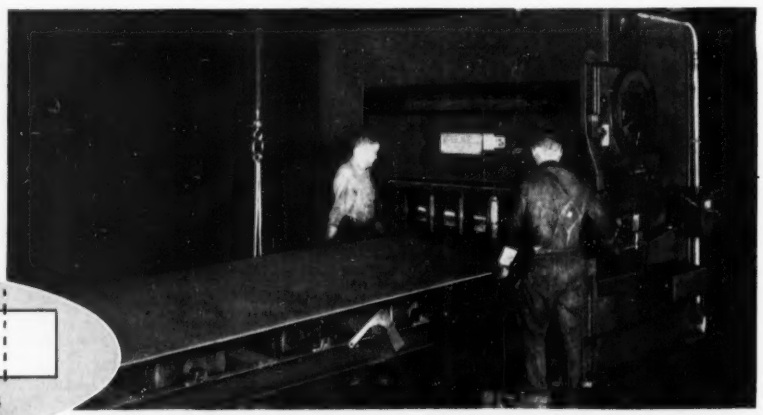
The standard 24" throat depth permits slitting sheets up to 48" wide on any line. 36" throats are also available for larger machines.

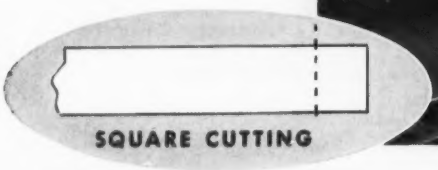
SQUARE or angle cut, slit or notch any can be made quickly on a Steelweld Shear.

Not only will Steelwelds handle every kind of cut, but they are provided with unusual features that make their operation easier and faster and assure accuracy.

Send for the catalog below. Learn why Steelweld Shears are the most outstanding on the market today.

Steelweld Shears operate on the widely acclaimed pivoted-blade principle. Shear action is controlled by electric foot switch. Machines for making cuts up to 24'-0" are now in service.





SQUARE CUTTING



GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

5437 East 282nd Street *Wickliffe, Ohio*

STEELWELD PIVOTED BLADE SHEARS

For more information on products advertised, use Inquiry Card, page 247

Farval lubrication holds transfer machine to continuous production

THIS Ex-Cell-O transfer machine is in a famous automobile engine plant. Its job is precision boring of the main bearing line (held to 0.0005 inch tolerance), the cam line (held to plus or minus 0.001 inch) and the distributor bore. It is built to operate at top speed, with uniform precision and efficiency.

To avoid shutdowns for oiling and for bearing repairs that accompany haphazard methods of hand lubrication, a Farval automatic lubricating system was installed. Farval lubricates while the machine is in full operation, entirely eliminating downtime for oiling, increasing bearing life, and allowing higher machine speeds by keeping bearings cooler.

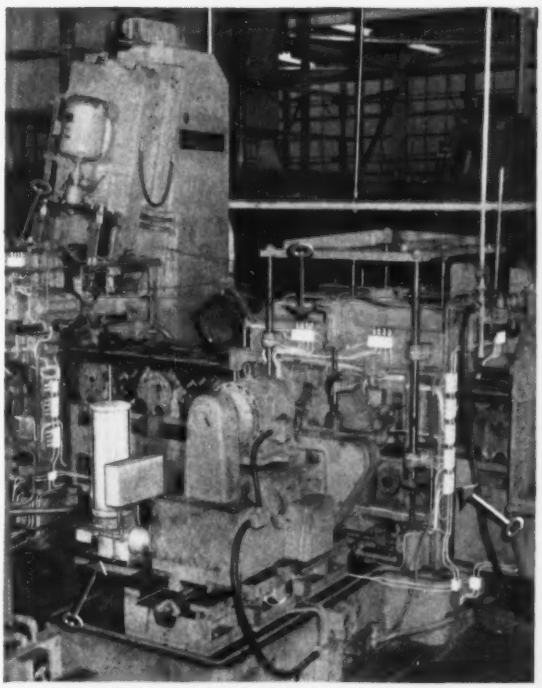
Farval is the original Dualine system of centralized lubrication that delivers oil or grease under pressure to a group of bearings from one central station, in exact quantities, as often as desired. The Farval valve has only two moving parts—is simple, sure and foolproof, without springs, ball-checks or pinhole ports to cause trouble. The easy-to-see indicators at every bearing show that each valve has functioned.

Today Farval protects millions of bearings in the automobile and allied industries, wherever equipment must be lubricated regularly and adequately to keep bearings on the job no matter how hard to get at.

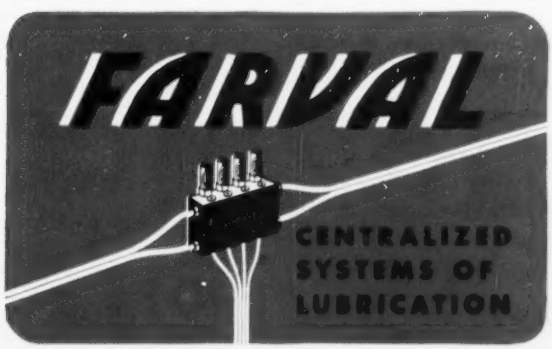
Find out how Farval can help keep your equipment running continuously for maximum production. Write today for free Bulletin 26. The Farval Corporation, 3276 E. 80th St., Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Co., Industrial Worm Gearing. In Canada: Peacock Brothers Limited.

FARVAL—*Studies in Centralized Lubrication* No. 146



KEYS TO ADEQUATE LUBRICATION— **Wherever you see the sign of Farval—the familiar valve manifolds, dual lubricant lines and central pumping station—you know a machine will be properly lubricated. Illustration by courtesy of Automotive Industries.**



For more information on products advertised, use Inquiry Card, page 247

To owners of BLISS *presses:*

You can benefit 4 ways from PRESS MODERNIZATION ASSEMBLIES

Factory-Engineered Installations in Your Own Plant Minimize Downtime

Owners of older Bliss presses* may now avail themselves of individual *factory-engineered*, but field-installed conversion and modernization assemblies calculated to yield these benefits:

1. ***Reduce*** *downtime by restoring original press efficiency.*
2. ***Increase*** *productivity beyond present specifications through* new *features.*
3. ***Save*** *roughly 60% of new press replacement cost.*
4. ***Amortize*** *the low cost of these gains in one year.*

A variety of modernization and conversion assemblies have been developed from our complete engineering records. These contain original specifications and subsequent changes for all presses built during the past 50 years. Thus, each installation perfectly augments a Bliss-built press; represents "genuine" modernization, not improvisation.

If you want: faster adjustments, more working strokes per minute, fast ejection of parts . . . chances are Bliss engineers can build these and other features of today into your older presses. Performance analysis of your press and recommendations will be made without obligation.

Detailed information about the 18 conversion assemblies identified on these pages is provided in Bulletin No. 45. Write for it today! Then ask your Bliss representative to show you how these modernization assemblies can be applied to *your* presses.

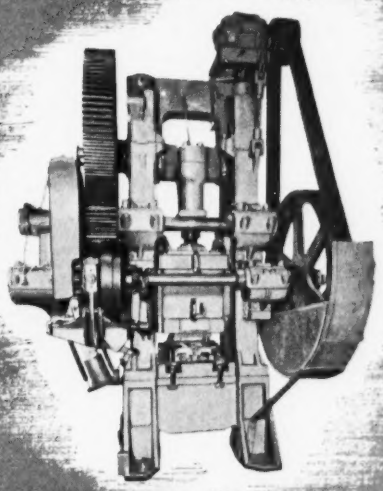
**and Bliss-serviced presses, including: Toledo, Marquette, Consolidated, Stiles and Cleveland Machine & Manufacturing Company.*



Yours for the asking

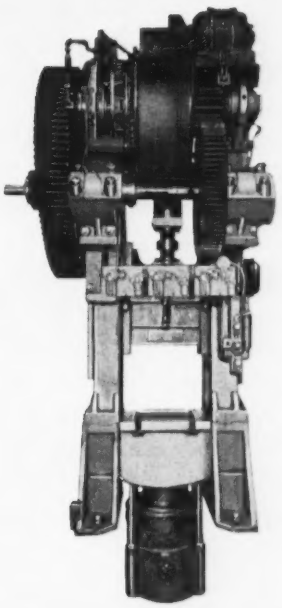
Bulletin No. 45—"Bliss Recommendations for Modernization and Conversion of Straight-Side and Gap-Frame Single Crank Presses".

BEFORE



Here is a single-action press requiring *manual* clutch operation. Not keyed to today's high production requirements, it occupies too much space, does not permit continuous operation and may present safety hazards to the careless operator.

AFTER



After pneumatic friction clutch and gearing modernization, it is now compact; occupies 40% less space; can be operated continuously, single-stroked, inched or stopped during any point in cycle. Operator fatigue is reduced and the safety factor is improved by electric push button controls.

Some Examples of Low-Cost Press Modernization Assemblies

Power slide adjustment for presses with manual slide adjustment.

Driveshaft roller bearing installation for presses with bronze or babbitt driveshaft bearings.

Pneumatic type slide counterbalance for presses with long strokes and heavy dies that are not equipped with counterbalance.

Spring type slide counterbalance for medium and small presses with normal slide stroke.

Pneumatic friction clutch and gearing for presses with mechanical friction clutches.

Conversion from positive to pneumatic friction clutch for presses with positive-type clutches.

Pneumatic friction clutch replacement for presses with mechanical friction clutches.

Conversion to twin end gear drive for single and gear driven presses with friction clutch drive.

Conversion from non-geared to single geared drive for non-geared presses with positive-type clutch.

Conversion to fixed inclined position for presses of fixed (usually vertical) position.

Bar type slide knockout installation for presses with slide having a knockout bar slot or slide machinable for the slot.

Bottom liftout installation for presses having a bed construction which permits installation of a bottom liftout.

Individual motor drive installation for any press driven by a line shaft or detached motor.

Pneumatic operator for mechanical friction clutch for presses with hand or foot operated mechanical friction clutches.

Pneumatic operator for positive type clutch for presses with hand or foot operated positive-type clutches.

Outside trimmer installation for presses with or without provisions for outside trimmer.

BLISS on your press is more than a name...*it's a guarantee*

E. W. BLISS COMPANY, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

E. W. Bliss (England) Ltd., Derby, England • E. W. Bliss Company (Paris), St. Ouen sur Seine, France

U. S. Plants in Canton, Salem and Toledo, Ohio; and Hastings, Michigan. Branch Offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. West Coast Representatives: Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. Other representatives throughout the world.

New Idea . . .
IN TESTING CASTINGS FOR LEAKS

TURNER MACHINE PRESSURE TESTS AND ISOLATES THE LEAK AUTOMATICALLY!

Turner leak-testing machines are adaptable to almost any size or shape production casting!

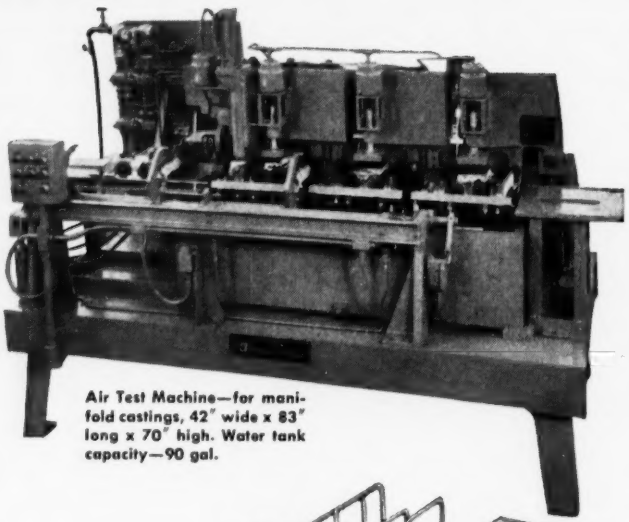
Fixture is specially designed to hold *your* casting, but base and all other parts are standard. That way manufacturing costs are kept at a minimum. You have all the advantages of a machine specially designed for your job, without paying for a special machine design!

Here are two typical applications:

1

Turner Air Test Machine

Designed to leak test manifold castings. Casting is picked up from the automation station, brought into loading position, then transferred automatically to each testing station. When casting is in position in the fixture, the machine clamps it securely in place and seals all openings. By means of air cylinders the casting is then dropped into a 90 gal. water tank and remains submerged for about 15 seconds—allowing the operator ample time to detect and mark any leak. As the checked casting is ejected onto the automation system, the transfer mechanism picks up another casting and the cycle is repeated.

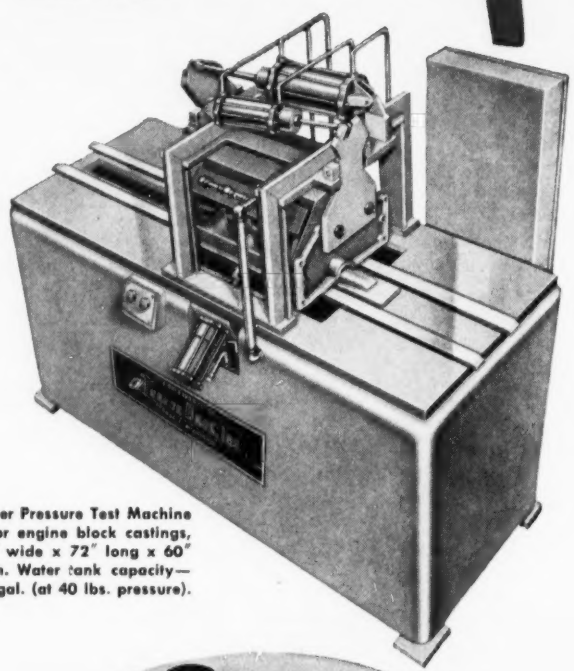


Air Test Machine—for manifold castings, 42″ wide x 83″ long x 70″ high. Water tank capacity—90 gal.

2

Turner Water Pressure Test Machine

Designed to leak test 8-cylinder engine block castings. In this special Turner machine application, engine blocks are manually loaded, but automatically clamped and unclamped in the holding fixture. Water is introduced into the block at 40 lbs. pressure, a force strong enough to allow the operator to visually detect possible leaks anywhere in the casting. For high production, this Turner machine can be equipped with an automatic transfer loading and unloading mechanism.



Water Pressure Test Machine —for engine block castings, 40″ wide x 72″ long x 60″ high. Water tank capacity—50 gal. (at 40 lbs. pressure).

• • •

If you have a production or inspection problem for which you can use to advantage a special purpose machine, write today describing your problem. After our engineering department analyzes it, our field engineer will discuss it with you.

• • •

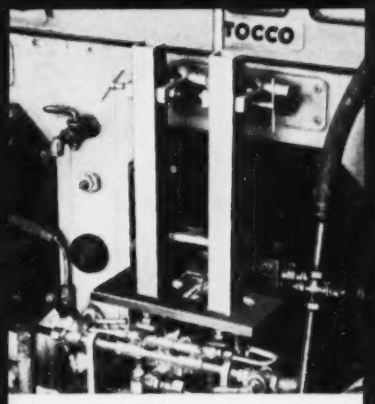
TURNER BROS. INC.
2625 HILTON ROAD
FERNDALE 20, MICHIGAN

DESIGNERS and BUILDERS of:
- **SPECIAL MACHINES**
- **JIGS and FIXTURES**

TURNER BROTHERS

For more information on products advertised, use Inquiry Card, page 247

Costs down 67%
Production up 400%



TOCCO-brazing drive shaft assemblies—two at a time. Photo—courtesy Mechanics Universal Joint Division of Borg-Warner Corporation.

with TOCCO* Induction Brazing

The shift from welding to TOCCO* induction brazing of the drive shaft assembly pictured here is typical of savings accomplished by TOCCO in over a thousand of America's leading metal-working plants. If you have brazing, soldering, heat-treating or heating for forming or forging operations in your plant TOCCO can probably save you money too.

COSTS DOWN 67%—Mechanics Universal Joint Division of Borg-Warner reports a 67% cost reduction in TOCCO-brazing yokes to tubing in the manufacture of power transmission shafts. Formerly, parts were hand-welded.

PRODUCTION UP 400%—Automatic TOCCO increases production from 11 to 45 pieces per hour—400% faster than former method. In addition TOCCO-brazing produces a cleaner, neater joint than possible with previous method.

TOCCO Engineers are glad to survey your plant, without obligation, of course, to determine where TOCCO Induction Heating can speed your production and cut your manufacturing costs.

THE OHIO CRANKSHAFT COMPANY



TOCCO

*Trade-mark Reg. U. S. Pat. Off.

Mail Coupon Today

NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. M-1, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening.

Name_____

Position_____

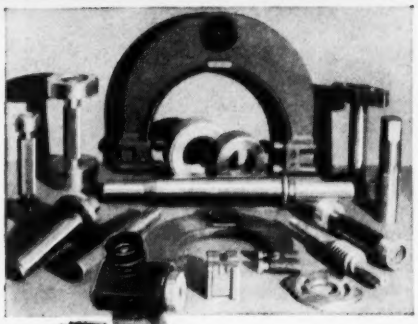
Company_____

Address_____

City_____ Zone____ State_____

SIP provides a Metrological Basis of the Highest Precision!

Equipped with **standard scales** ruled on the same dividing engines on which official length standards are graduated, this machine constitutes a unique and permanent metrological basis of the highest precision to which all measurements can be referred.



Universal Measuring Machine

MU-214B

with built-in standard scales

SPECIFICATION

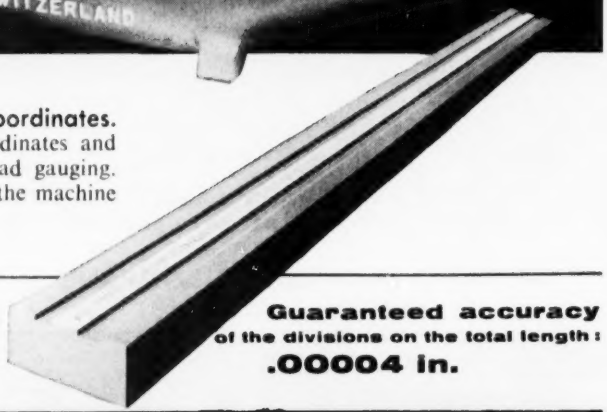
Measuring range	16″×4″×6″
Linear readings to	0.00005 in.
Angular readings to	1 min. of arc
Table surface	19¼″×5½″
Net weight	420 lbs.



Linear measurements according to **three rectangular coordinates.** Precision rotary table for measurements in polar coordinates and goniometric microscope for angular readings and thread gauging. Extensive set of accessories enabling the user to adapt the machine to his specific requirements.

Guaranteed accuracy: .0001 in.

This is one of the standard scales which are totally enclosed and assure the high accuracy and absolute reliability of all measurements carried out on the MU-214B Machine.



Guaranteed accuracy
of the divisions on the total length:
.00004 in.

REPRESENTATIVE FOR U.S.A. AND CANADA

AMERICAN SIP CORPORATION

HIGH PRECISION MACHINE TOOLS AND MEASURING EQUIPMENT

100 East 42nd Street NEW YORK 17, N.Y.

A20

For more information on products advertised, use Inquiry Card, page 247

GET EXTRA TAPPING CAPACITY AT *LOW COST*



- Fits the drill press spindle just like any other shank tool. No alterations necessary.
- Super-sensitive friction clutch provides full protection against tap breakage and work spoilage.
- Quill clamps are available for absolute rigidity.
- Made in 7 sizes for 0 to 1" taps.

For Full Details Write For Bulletin No. 22

IT PAYS TO BUY THROUGH YOUR LOCAL ETTCO-EMRICK DISTRIBUTOR

He offers you . . .

1. Years of experience as a qualified specialist in selling tapping and drilling equipment.
2. A sales and service force ready to give you on-the-spot assistance at all times.
3. Ample stocks — quick deliveries — authoritative information on Ettco-Emrick equipment.
4. Expert advice in selecting the right equipment for your needs.
5. A personal interest in your problems—he knows that *his* success depends on *your* satisfaction.

Call him today — he's only as far as your telephone.

Ettco-Emrick
TAPPING ATTACHMENTS

Ettco-Emrick

ETTCO TOOL CO., INC.
592 Johnson Ave., Brooklyn 37, N. Y.

DETROIT • CHICAGO • WORCESTER • SAN GABRIEL, CALIF. • Dealers throughout the United States and Canada

For more information on products advertised, use Inquiry Card, page 247



Lake Arrowhead, San Bernardino, California — Shostal Press Agency Photo

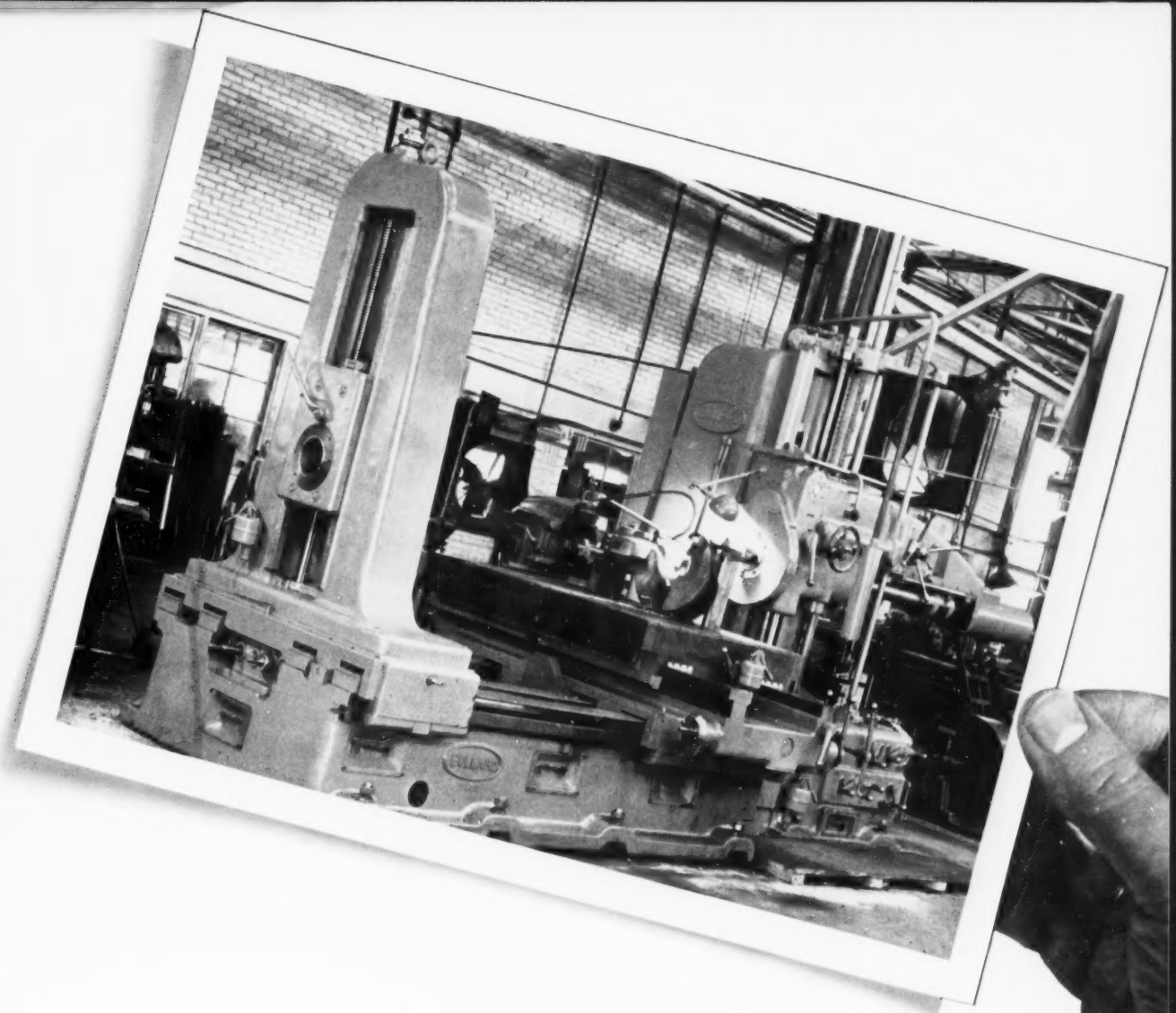
BULLARD

The Invisible Background of Industrial Progress

To fully enjoy Nature's Winter Wonderland, it is necessary that the nation's snow-covered highways be kept open to traffic. Winter sport enthusiasts respond to the "call of the open road" to participate in skiing, skating, ice fishing, tobogganing, ice boating and hunting, to mention just a few. Commercial traffic depends on these same highways to move raw and finished materials, goods and products, from plant to consumer.

Manufacturers of highway snow-removing equipment, such as trucks, snowplows and bulldozers, have recognized that Bullard Machine Tools are highly efficient manufacturing units—a testimonial that *Modern Machine Tools* are truly "The Invisible Background of Industrial Progress."

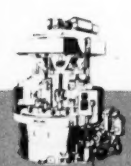
THE BULLARD COMPANY • BRIDGEPORT 2, CONNECTICUT

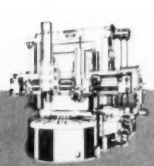


With constant demand on the part of industry to improve productivity at a lower cost specify Bullard 4-Way Bed Horizontal Boring, Milling and Drilling Machines and invest in profits through manufacturing efficiency. This modern machine tool is designed and built to provide rigid support with the heavily constructed table permitting the machining of heavier work pieces with a higher degree of maintained accuracy.

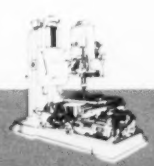
Long life is also assured through heavier box-type saddles, anti-friction extension bar support in the heavier rear post and motor-driven lubrication pump for the gear box.

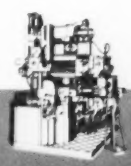
For a complete story on the Bullard 4-Way Bed, 4 inch or 5 inch spindle, Horizontal Boring, Milling and Drilling Machines, call in your nearest Bullard representative or write to The Bullard Company, 286 Canfield Avenue, Bridgeport 2, Connecticut, or phone 6-2511.


CONTIN-U-MATIC


CUT MASTER


HORIZONTAL BORING


SPACER


MAH-AU-TROL


MULT-AU-MATIC

BULLARD

JETWELD

NOW, Lincoln joins *powdered metal* with the electrode to utilize the heat of the arc more efficiently . . . to achieve fastest hand welding speeds ever accomplished . . . with new quality standards.



Jetweld is a shielded-arc type electrode designed for fast, easy operation with AC or DC. Powdered metal in the coating makes welds amazingly crack resistant, provides extra impact properties not found in conventional E-6012 electrodes. Welds compare in appearance with "hidden-arc" welds.

Operators like Jetweld for its smooth, stable arc action . . . its remarkable improvement in resistance to arc blow. Spatter is practically nil . . . welds are self-cleaning. Bead shape is flat.

Jetweld is designed for horizontal and flat position fillets, horizontal and flat position laps, single and multiple pass butts. It meets the physical requirements of a class E-7016 electrode and is used on work formerly calling for E-6012 and E-6020 electrodes.



JETWELD cuts deep into the 86¢ out of every welding dollar that goes for labor and overhead . . . can save you $14,190 per carload. Here's why:

FASTER WELDING—Jetweld's higher deposition rate now makes it possible for you to save enough money to warrant scrapping existing supplies of conventional E-6012 electrodes. Easier to restrike when cold, Jetweld simplifies tack welding. Simple to operate . . . Jetweld is a "drag" electrode with exceptionally stable arc characteristics.

HIGHER QUALITY—Weld metal is uniform, of X-ray quality, free of undercut with improved impact values at low temperatures. Jetweld is ideally suited for welding higher-carbon steels normally welded with low-hydrogen electrodes . . . without cracking and without surface holes There is no coating breakdown . . . stub losses are less.

GET JETWELD'S COST-CUTTING FACTS TODAY. . . Your Lincoln field engineers will gladly demonstrate how new Jetweld accomplishes the savings shown above. Full details are in Lincoln Bulletin 481, write Dept. 1511:

THE LINCOLN ELECTRIC COMPANY

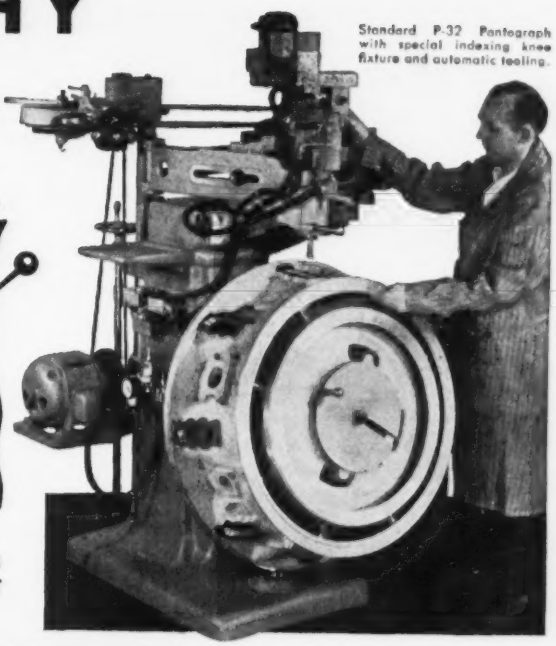
Dept. 1210
CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

For more information on products advertised, use Inquiry Card, page 247

PANTOGRAPHY

Solves Complex Profiling Problems with Automatic Cutting Cycle

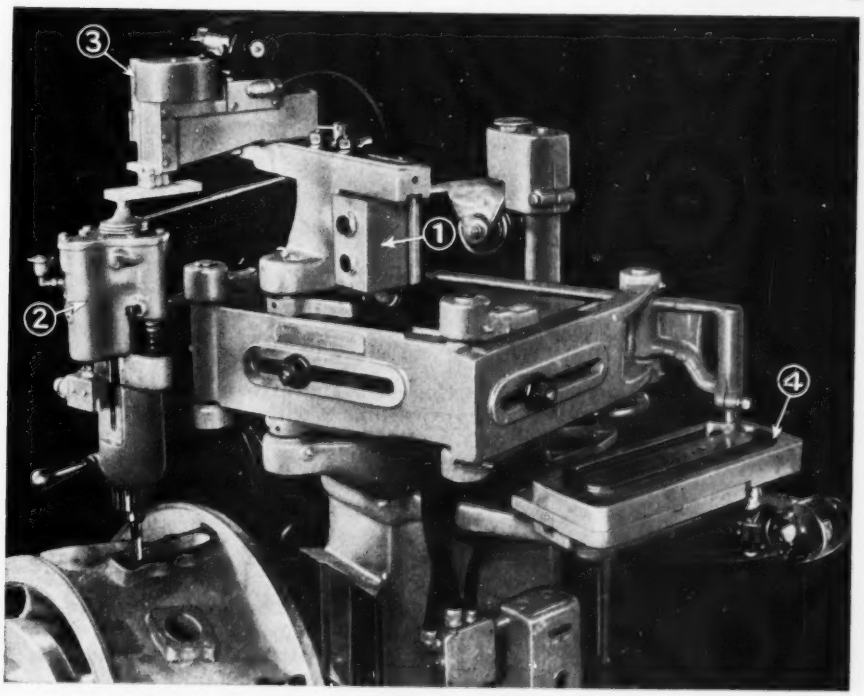


Standard P-32 Pantograph with special indexing knee fixture and automatic tooling.

PROBLEM: Profiling eight ports in outside portion of aircraft part, a large aluminum-alloy casting. The sides of each port are parallel; one end has a true radius, the other end is parabolic.

SOLUTION: Gorton P-32 Pantograph profiles all eight ports at the rate of 2.3 minutes per port. Cutting cycle is automatic; indexing is manual.

This is truly a power-driven tracer-control job that would require hours if done by a combination of other methods.



Here's How It Works

❶ Complete cutting cycle begins when "start" button is pressed.

❷ Air cylinder automatically feeds cutter down to cutting position. Cam-operated spindle down feed then takes over. Upon completion of cut and after spindle retracts, this air cylinder further retracts cutter for clearance.

❸ Speed of spindle down feed during cutting is controlled by cam through a Variac.

❹ Motorized chain-driven master starts automatically when "start" button is pressed.

This is just one of many Gorton tracer-controlled production short-cuts which might save you time and money. For complete information, clip and mail the coupon now.



Please send at once complete information about the Gorton line contained in Bulletin 1655-1201

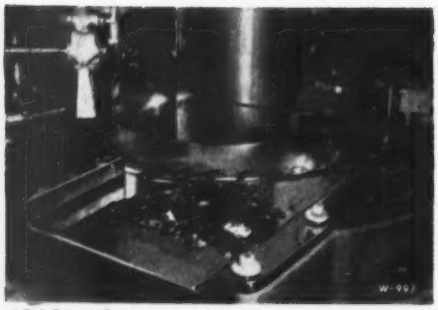
Firm .....

Name .....

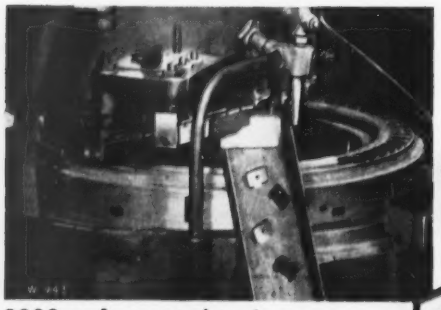
Title .....

Address .....

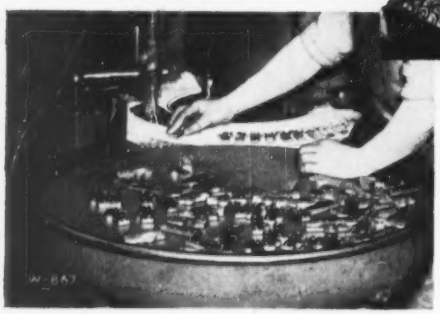
City, State .....



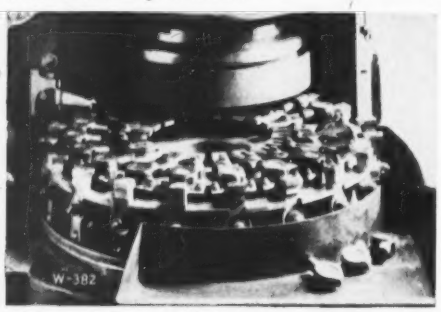
4360 surfaces per hour!



2000 surfaces per hour!



940 surfaces per hour!



900 surfaces per hour!



1400 surfaces per hour!



FIELD REPORT:

... a Blanchard No. 16-A Surface Grinder saved them $39,000 in 2½ years! (cost approx. $12,500) Their order follows for a Blanchard No. 16-A2!

Here's proof of performance and proof of satisfaction, yet typical of what users expect *and get* from the Blanchard 16-A Surface Grinder. Several typical examples of production rates are shown here. Above, for instance, .003" of stock is being removed from one side of small gears to a tolerance of ±.001" *at a rate of 2100 per hour!* This machine has a 30" chuck and a Blanchard Demagnetizer.

The No. 16-A grinds continuously with a wheel that is set and automatically maintained at a fixed height above chuck face, and finishes one surface of the work to size in one pass under wheel. Operator has only to load the work on the magnetic chuck or in an automatic clamping fixture. A wheel control automatically feeds the head down to compensate for wheel wear. Unloading is usually automatic. Attachments can be supplied for demagnetizing and washing the work as it leaves the grinder. On most work, limits of ±.0005" are readily maintained.

The No. 16-A2 (not shown) has two wheels, each with automatic size control. It roughs and finishes one surface of the work in one pass through the machine.



Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

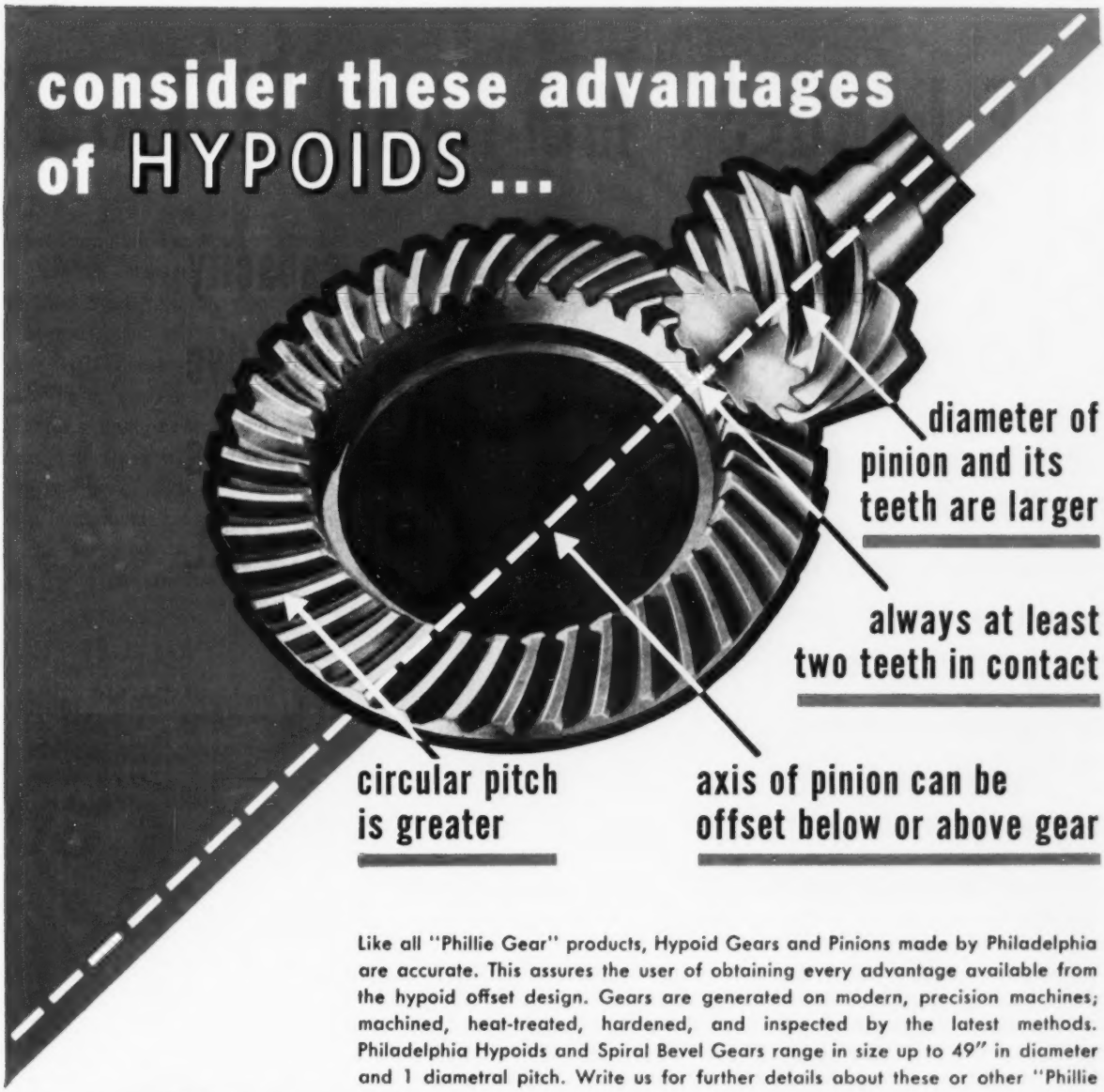
PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE CO.

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

For more information on products advertised, use Inquiry Card, page 247

consider these advantages of HYPOIDS ...

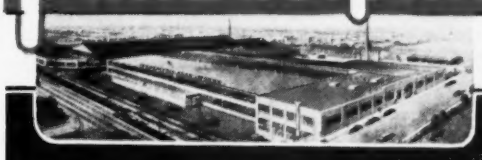


Like all "Phillie Gear" products, Hypoid Gears and Pinions made by Philadelphia are accurate. This assures the user of obtaining every advantage available from the hypoid offset design. Gears are generated on modern, precision machines; machined, heat-treated, hardened, and inspected by the latest methods. Philadelphia Hypoids and Spiral Bevel Gears range in size up to 49" in diameter and 1 diametral pitch. Write us for further details about these or other "Phillie Gear" products.

PHILLIE GEAR ®

Spur	Herringbone	Spiral Bevel
Helical	Worm	Zerol
Spur Internal	Non-Metallic	Hypoid
Helical Internal	Spline-Shafts	Intermittent
Racks	Coniflex-Bevel	Sprockets

Philadelphia Gear Works, INC.



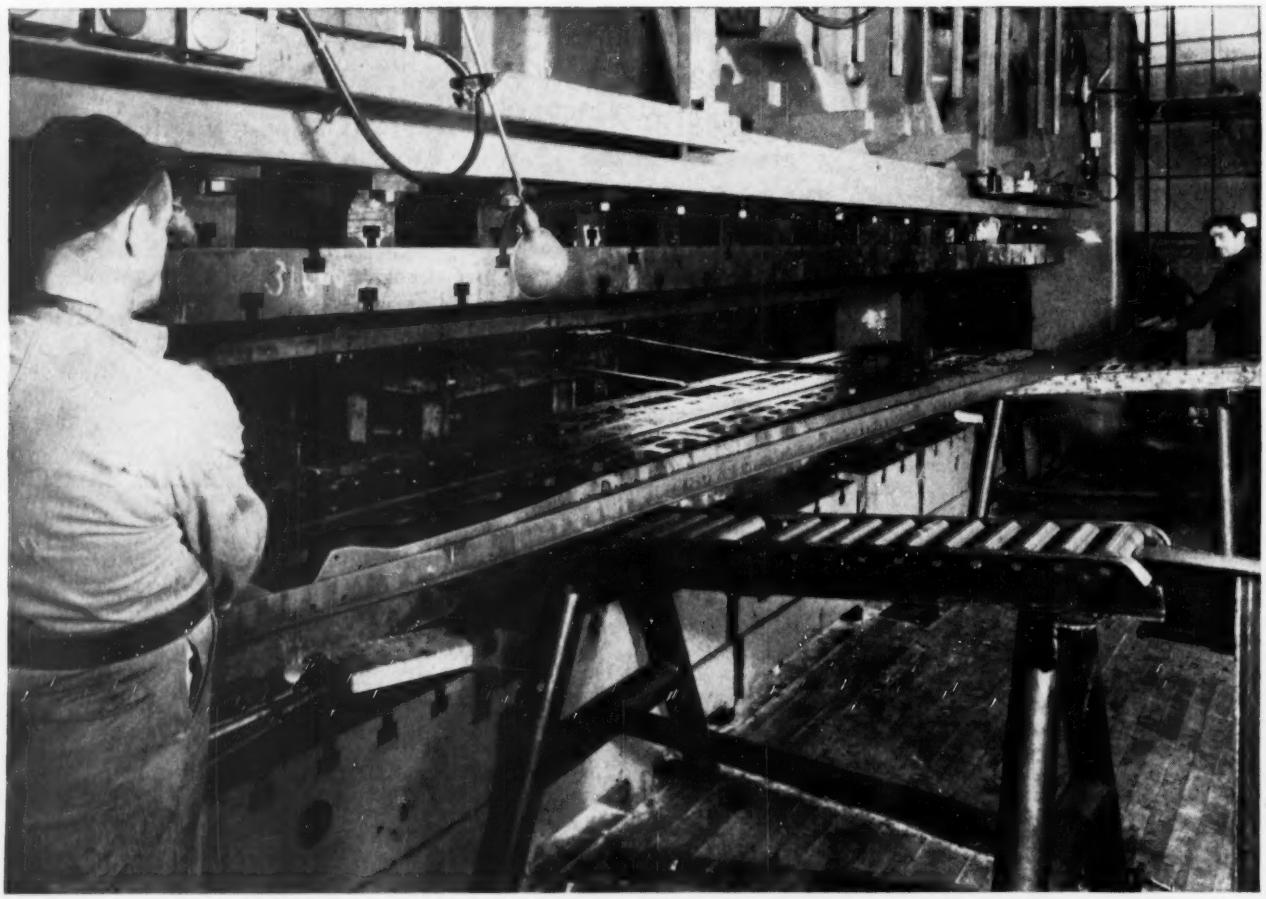
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

THE LARGEST MECHANICAL PRESS

New Hamilton 4000 tons capacity press, in which there is no relative deflection in bed and slide, forms side rails that are perfectly straight.



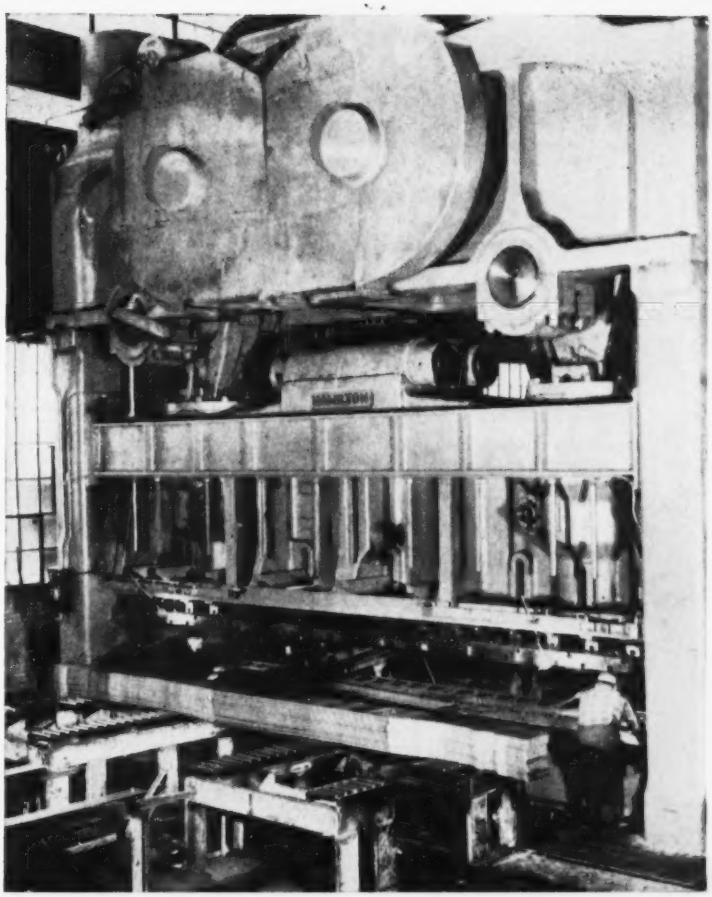
22-FT. SIDE RAIL is shown above being removed from the press. Perfectly straight 26½-ft. side rails of ⅜-in. steel can be formed without camber or "bow." The pressure pad is supported on six air cushions which function as a unit to prevent distortion when the side rail is ejected from the die.

EVER BUILT

This Hamilton Side Rail Press was placed in production last winter in the Cleveland Plant of Midland Steel Products Company. It is an enormous machine, weighing 900 tons, which in itself is newsworthy. However, the outstanding feature is its ability, when loaded to 4000 tons pressure (its nominal capacity) to form perfectly straight side rails, without camber or "bow." This eliminates the subsequent straightening operation which has been the accepted customary practice in chassis frame manufacture.

Other "highlights" of this 4000 ton Hamilton Press

- The bed is equipped with six 42-inch diameter air cushions providing 415 tons pad-pressure with air at 100 psi.
- The cushions are linked together and the operating valves are controlled by one pilot valve so that the six cushions function as a unit at all times.
- Overall height 44 feet with topmost point 30 feet above floor.
- 320 inch clear space between the uprights and gibs; shut height on bed 40 inches.
- Stroke of slide 22 inches; adjustment 12 inches.
- Drive motor 150 hp; slide adjusting motor 25 hp.



NEW HAMILTON PRESS, the largest of its type ever built—4000 tons pressure capacity—is pictured here forming truck chassis side rails 22 ft. long from ¼ in. steel at Midland Steel Products Company, Cleveland, Ohio.

HAMILTON PRESS DIVISION

Baldwin-Lima-Hamilton Corporation

Curtis Building

Detroit 2, Michigan

BALDWIN BLH LIMA-HAMILTON

BALDWIN—LIMA—HAMILTON

Branch Offices: New York • Chicago • Factory: Hamilton, Ohio

hendey lathes are better built...

FOR LONGER, MORE ACCURATE LIFE!

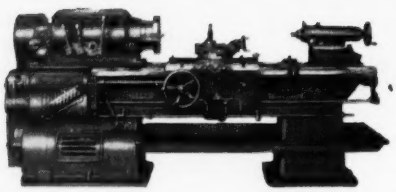
And here's how it's done — Hendey starts with quality design and follows through with quality workmanship. Take the hardened and precision ground bed ways, for instance. Hendey does this differently *and better!* First, the world's most modern induction hardening equipment uniformly hardens the ways. Next, the precision machined legs and chip pan are attached to the bed (and they are never removed thereafter). Ultra precision grinding follows. Exacting checks for accuracy are then followed by electronic testing for hardness — uniform hardness — there are no soft spots in a Hendey bed — and a customer's test sheet proves it!

Add to this, quiet headstocks, the finest of lead screws, simplified, convenient controls and the ruggedness and power essential for modern precision turning.

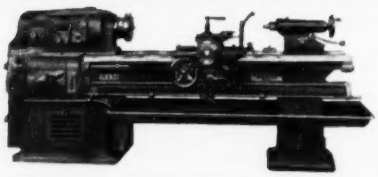
Hendey lathes maintain the Hendey tradition for quality and accuracy. And there is the *right* machine in the Hendey line to suit your precision turning requirements. Write for details.

THE HENDEY MACHINE CO
HARDENED AND GROUND BED WAYS

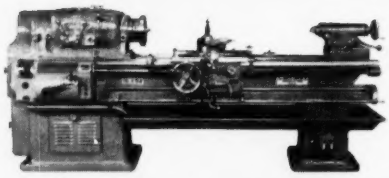
Featuring uniformly hardened and precision ground bed ways.



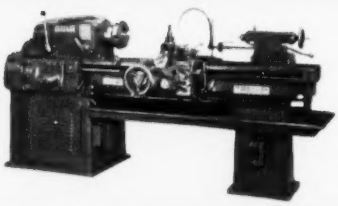
18″ — 20″ — 24″ 12-speed Geared Head Lathes



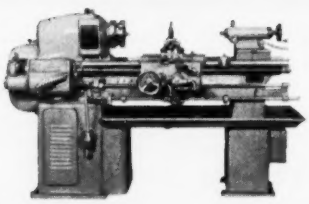
12″ — 14″ — 16″ 18-speed Geared Head Lathes



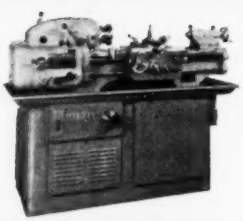
12″ — 14″ — 16″ 12-speed Geared Head Lathes



No. 2 General Purpose Lathe



No. 1 General Purpose Lathe



9″ x 24″ Tool & Gage-Makers' Lathe

HENDEY

the Hendey machine co., inc.
torrington, conn., u.s.a.
——precision machine tools——

distributors in principal cities

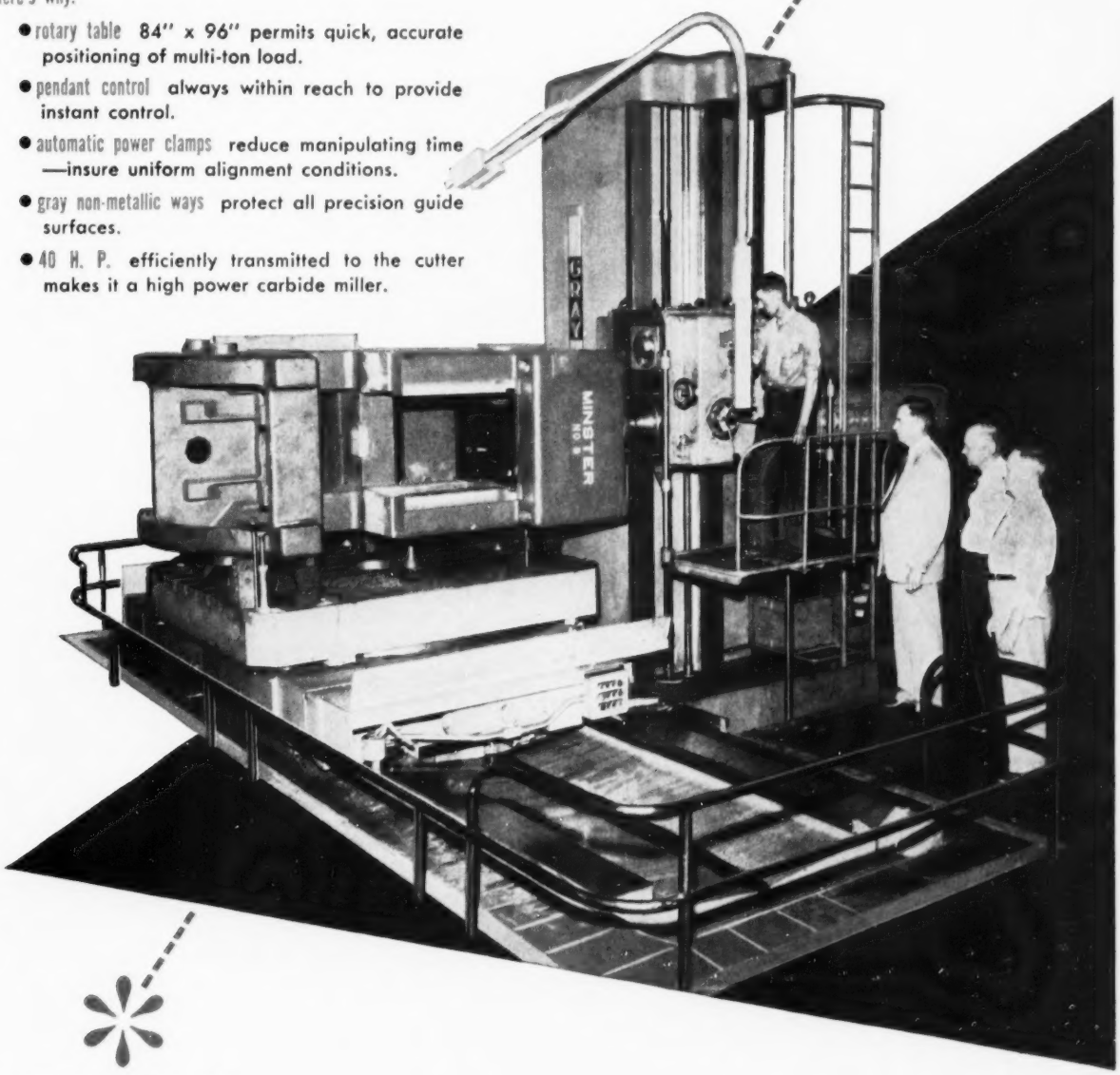
For more information on products advertised, use Inquiry Card, page 247

"Inside Story" on doubling production at the Minster Machine Co., Minster Ohio

This GRAY 6" PLANER TYPE BORING MILLING AND DRILLING MACHINE is really delivering "versatility with a punch."

Here's why:

- rotary table 84" x 96" permits quick, accurate positioning of multi-ton load.
- pendant control always within reach to provide instant control.
- automatic power clamps reduce manipulating time —insure uniform alignment conditions.
- gray non-metallic ways protect all precision guide surfaces.
- 40 H. P. efficiently transmitted to the cutter makes it a high power carbide miller.



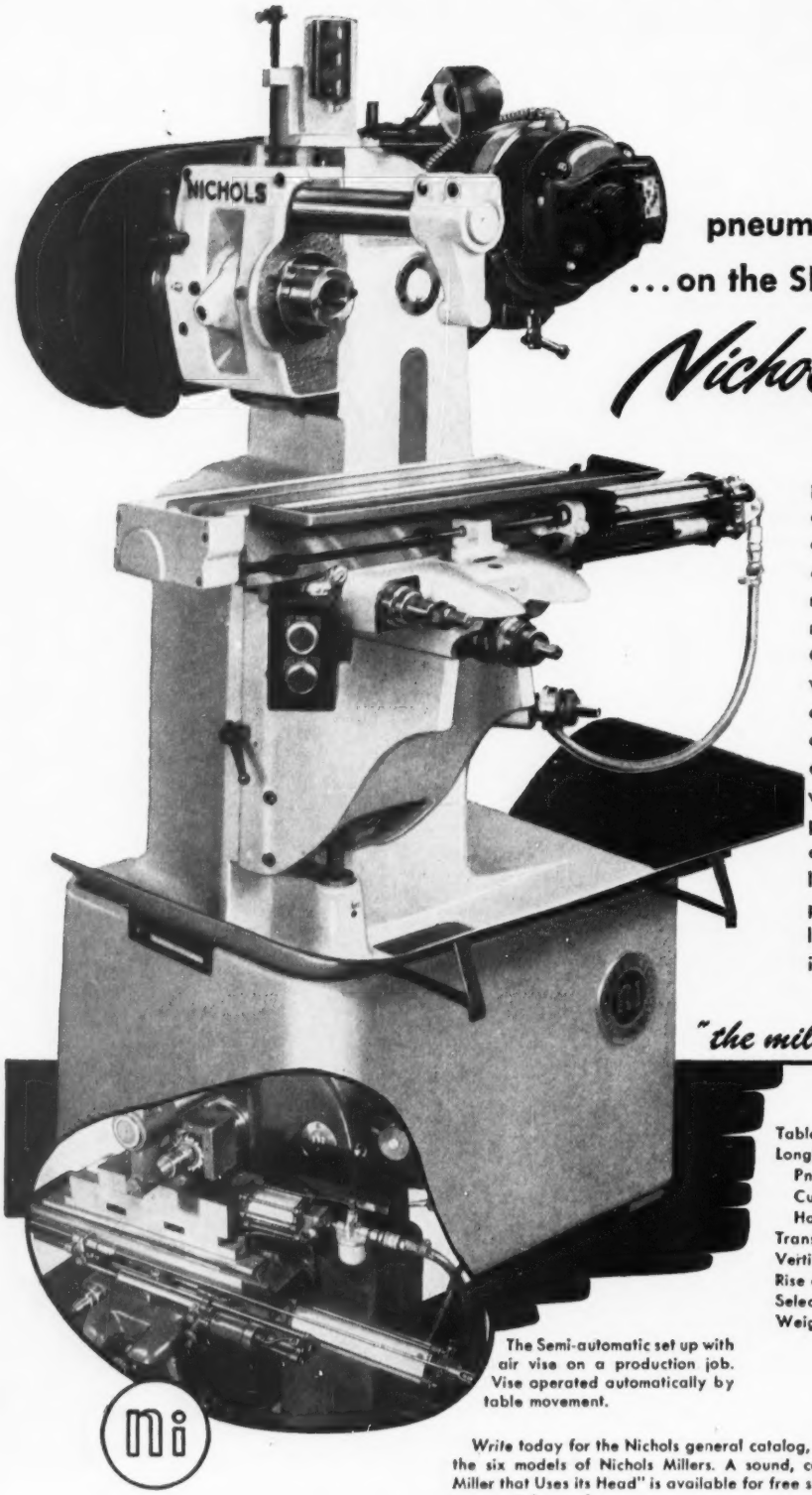
Production times have already been cut in half. Further savings are assured when they "open her up."

Dept. B

The G.A. **GRAY** Company

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES



pneumatic feed — for speed ... on the SEMI-AUTOMATIC

Nichols Miller

In selecting the Nichols Miller with pneumatic table feed, you obtain precision and a high-production semi-automatic machine. The push-button controlled power feed is entirely automatic — leaves the operator free to merely load and unload the work. Often he may run two or three millers with ease. The air cylinder works against the cutter *and* the hydraulic cylinder — completely eliminating chatter and table jump. The unit provides rapid advance from loading position to the cutter, infinitely variable cutting feed, and rapid return to loading position. Also available with power vertical feed to spindle head. If you want high production to "tenths", investigate the Nichols Semi-automatic!

"the miller that uses its head!"

CONDENSED SPECIFICATIONS

Table Working Surface	6¼" x 21"
Longitudinal Travel	
Pneumatic	9"
Cutting Stroke	5¼"
Hand Screw (Optional)	10"
Transverse Travel	7"
Vertical Travel — Knee	13½"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to 5000 R.P.M.	
Weight	1250 lbs.

The Semi-automatic set up with air vise on a production job. Vise operated automatically by table movement.

Write today for the Nichols general catalog, which describes the six models of Nichols Millers. A sound, color movie, "the Miller that Uses its Head" is available for free showing. May we reserve it for you?



MANUFACTURED BY W. H. NICHOLS COMPANY WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS **NICHOLS-MORRIS CORPORATION**

76-E MAMARONECK AVE. WHITE PLAINS, N. Y.

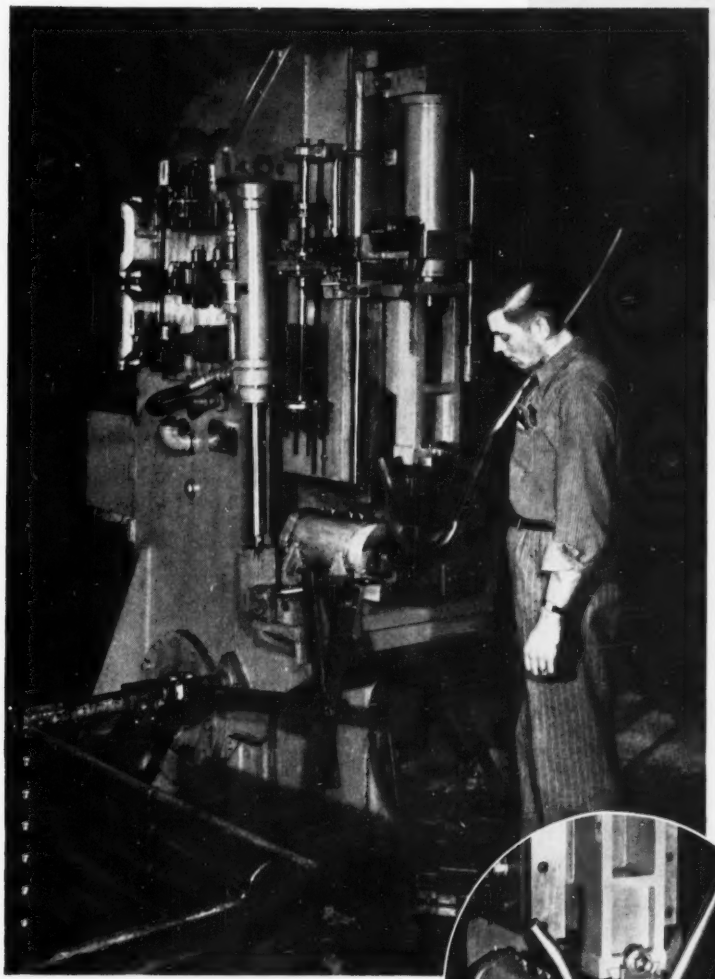
For more information on products advertised, use Inquiry Card, page 247

New PINES 20-TON BENDING PRESS

PRODUCES AUTOMOTIVE EXHAUST PIPES



50% FASTER



▲ Production view of new Hydraulic Bending Press now producing, in a single setup and with one operator, 4 to 8 multiple bends on automotive exhaust and tailpipes at speeds from 600 to 800 bends per hour.



◀ Closeup view of Pines Bending Press forming 4th bend in a 1⅝" (16 ga.) CRS automotive exhaust pipe. Note how wing dies are controlled by side-mounted cushions through heavy crank arms. Interchangeable pick-off turret of angle-of-bend selector saves set-up time on repeat jobs.

The new Pines 20-Ton Hydraulic Pipe and Tube Bending Press is now establishing new records of production efficiency on many different bending operations. For example, on automotive exhaust and tailpipes, multiple bends with 4" and 6" radii are now produced in 1-1/4" to 2" O.D. 16 ga.-18 ga. tubing at speeds ranging from 600 to over 800 bends per hour.

On an over-all basis, current results show these jobs are produced 50% faster than with ordinary bending press equipment. At the same time, because of the design of the Pines, savings up to 30% in setup time are effected. Further, because more jobs can be handled in a single setup, there's a substantial reduction in tooling expense. If you have work adaptable to a bending press, it will pay you to see Pines today.

CHECK THESE COST-CUTTING PRODUCTION FEATURES

- ✔ **Twin Equalizing Side-Mounted Cushions** — provide greater working clearance, maintain constant torque, reduce flattening and distortion.
- ✔ **Faster Cycling** — angle-of-bend selector indexes and resets to starting position automatically without indexing through idle stations, increases output.
- ✔ **Greater Work Handling Capacity** — extra clearance reduces number of setups on multiple bending, permits broader use of uniform radii, cuts tooling and production costs.
- ✔ **Interchangeable Pick-Off Turret** — for angle-of-bend control. Permits storing and remounting for repetitive jobs, reduces setup time.
- ✔ **Adjustable Ram Speed Control** — assures efficient operation, simplifies setups. Ram can be lowered slowly or stopped at any point.

WRITE FOR NEW 4-PAGE BULLETIN

Write today for free bulletin completely illustrating and describing the new Pines Bending Press and its cost-cutting production features.



PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery | 686 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

now!... and

Copper Plated

Certified
BRAD FOOTE GEARS

Here is a way for you to be sure that you are getting gears that—**1**) meet or beat AGMA requirements; **2**) are made according to an exclusive BRAD FOOTE formula which provides long, trouble-free service; and **3**) reduce final costs. You simply specify "*Certified* BRAD FOOTE Gears"...and here's what you get—

Manufacturing

Certified BRAD FOOTE Gears are made to your order...from your specifications...or from specifications we develop for you. Every operation, from machining through heat treating, on every gear, gearmotor, reducer, or transmission is done in our own shops and carefully controlled by BRAD FOOTE engineers.

Testing of *Certified* BRAD FOOTE Gears is done with modern hardness testers, Magnaflux, Metallograph, Shadograph, and numerous micro-gauges. That's why we can say "*No one shares our responsibility.*"

Copper Plating

You get three distinct advantages from the copper plating* of *Certified* BRAD FOOTE Gears. The copper plating prevents corrosion. It eliminates messy, dirt-catching greases. It permits gears to be kept on hand indefinitely without ill-effects.

Another thing, the thin copper plating acts as a lapping compound which lets the gears run in smoothly and quickly. You do not have to remove it from teeth or bearing surfaces.

And, copper plating is your positive identification of *Certified* BRAD FOOTE gears. It's your guarantee of quality. It's your assurance that the gears you bought have long-wearing teeth and bearing areas, and tough cores that will give you service equal to or better than that of any other gears made.

Certificate

Furnished with every order of *Certified* BRAD FOOTE Gears and assemblies is a Certificate bearing our order number and signed by BRAD FOOTE'S Product Certification Manager. It certifies strict adherence to specifications and the formula applying to *Certified* BRAD FOOTE Gears. You can't buy better gears.... *Yet...you pay no more.*

Write today for descriptive literature



© BFGW, INC.

BRAD FOOTE GEAR WORKS, INC.

1309 South Cicero Avenue • Cicero 50, Illinois
BIshop 2-1070 • OLympic 2-7700

subsidiaries

AMERICAN GEAR & MFG. CO.
Phone: Lemont 920
Lemont, Illinois

PITTSBURGH GEAR COMPANY
Phone: SPaulding 1-4600
Pittsburgh 25, Pennsylvania

no increase in Price!



Certificate

This is to certify that:

1. The products furnished on BRAD FOOTE order number 10945, readily identified by their corrosion-preventive copper plating,* were made according to an exclusive BRAD FOOTE formula which controlled every step in the manufacturing process.
2. Only the finest quality metal for the particular service in which the products will be placed was used.
3. All machining specifications, where necessary, were held to extremely close tolerances.
4. Heat-treating of ferrous metals was carefully controlled by skilled workers using modern equipment.
5. Original specifications were adhered to and every operation was rigidly inspected.
6. All hardness specifications of teeth, cores, bearing areas, etc., were accurately tested on modern Rockwell or Brinnell hardness testers.
7. All standards of the American Gear Manufacturers' Association (AGMA) were met or bettered.
8. These BRAD FOOTE *Certified* Products were made to give service that is equal to or better than you might receive from any other similar products in equal service.

*Products over 30" diameter are protected by copper-colored water-soluble paint which need not be removed before placing in service. Plating and painting are not applicable to internal parts of assemblies.

Certified® BRAD FOOTE PRODUCTS

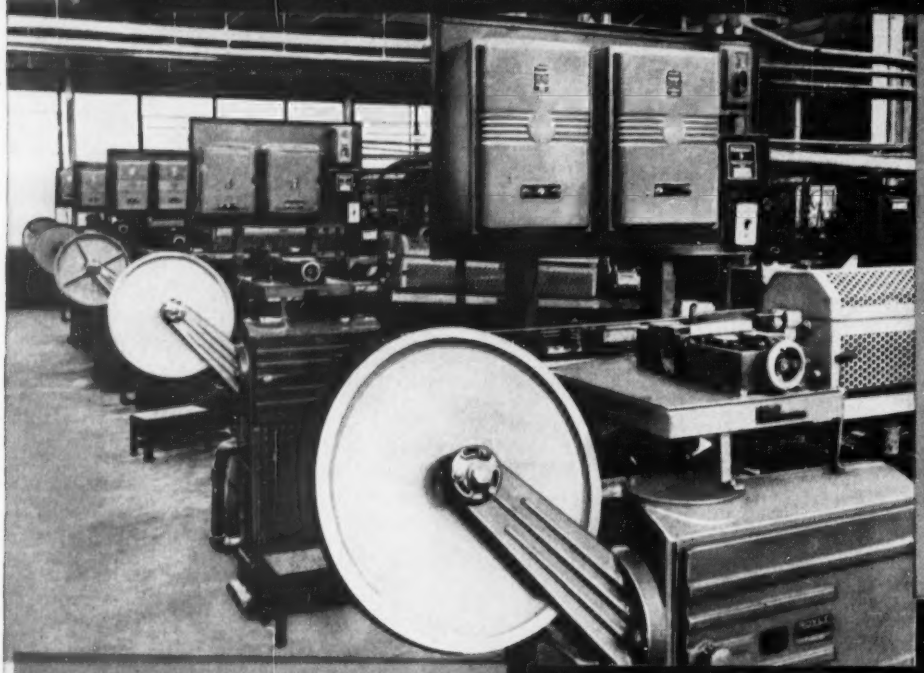
Signed _____ Manager
Product Certification

Date _____

BRAD FOOTE GEAR WORKS, INC.
Cicero 50, Illinois

*Gears over 30" diameter are protected by copper-colored water-soluble paint which need not be removed before placing in service

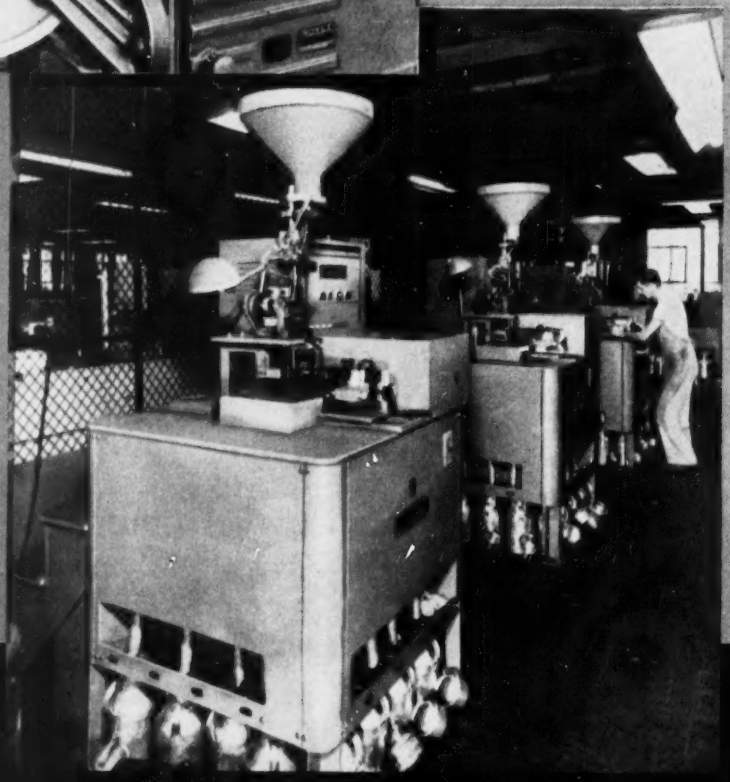
For AUTOMATION GAGES



Automatic machine control for quality production. Five Federal continuous measuring machines automatically and precisely control the thickness of insulation as it is applied on wire. Machine Tools for turning, grinding, etc., and production machines for extruding, rolling, pressing, forming and other operations can likewise be controlled by Federal Automation Gages.

●

Federal automatic sorting gages for a great variety of mass produced parts, from balls ¼" in diameter to large workpieces, can be installed in batteries, or singly — for full-automatic or semi-automatic operation as desired.



..... see Federal!

Federal Automatic Gages are the Brain in the Automation programs of leading plants in many industries.

Without human control and at high speeds, Federal gaging machines now control and adjust the feeds of machine tools, continuous material-producing machines and other types of machinery so that the end product is continually in dimensional control.

These gages can be installed directly in your production line and synchronized with the output from your machine tools or other production machines.

Where production does not warrant such extreme Automation, gages *immune to human error* sort and distribute parts at speeds which until recently were fantastic and to limits in the order of a few millionths or better.

To help you benefit from Automation on your jobs, Federal offers all modern gaging methods . . . Air, Electric, Electronic and Mechanical. We'll gladly work with you on your gaging problems. Federal Products Corporation, 1111 Eddy St., Providence 1, R. I.



. . . everything in modern gaging for dimensional control



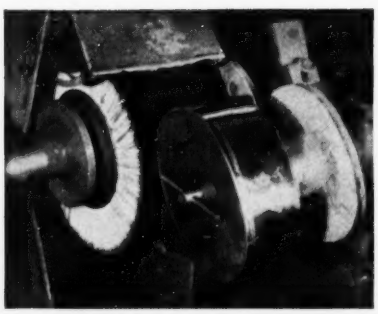
X unmarks the spot...at 1750 rpm

Heavy Presses form these waffle iron lids. But they leave draw marks on the cold rolled steel . . . marks which must be removed before the lids take their nickel plating bath.

That's when the Osborn Fascut® brushing sections go to work for this appliance manufacturer. Under those waffle-iron panels are wooden forms, attached to the table which moves the panels back and forth under the rotating (1750 rpm) Fascut brushes. A flexible back-up roll regulates the pressure during brushing.

Not only do the Fascut brushes blend away the draw marks quickly... but the panels are also finished at the same time. This eliminates a time-consuming hand-finishing operation. Now the manufacturer produces 250 panels an hour, *twice the output* before the Osborn Fascut brushing sections were adopted.

Whatever *your* product . . . metal, rubber, plastic or other material . . . it will pay you to have your **O**sborn **B**rushing **A**nalyst study your operations to suggest the money- and time-saving techniques made possible by Osborn power brushing methods. Call or write *The Osborn Manufacturing Company, Dept. D-13, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



300% greater wear is obtained from the Osborn Monarch Brushes used here than with the Tampico brushes used previously. In this push-button brushing operation, a smooth lustrous finish is produced prior to nickel plating.

FREE:
New booklet on deburring with Osborn Power Brushing. Write for your copy.



Osborn Brushes

OSBORN BRUSHING METHODS • POWER, MAINTENANCE AND PAINT BRUSHES • BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

For more information on products advertised, use Inquiry Card, page 247

Everything You've Ever Wanted From a Clutch!

FULL COMPLEMENT

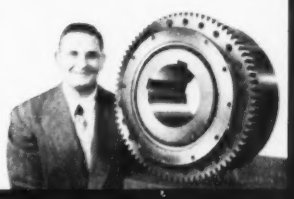
FORMSPRAG Clutches

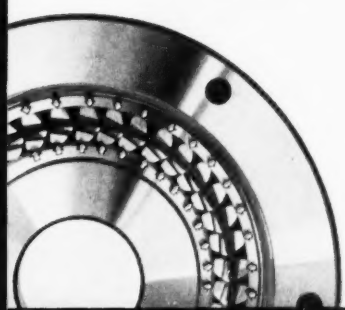
OVER-RUNNING · BACKSTOPPING · INDEXING



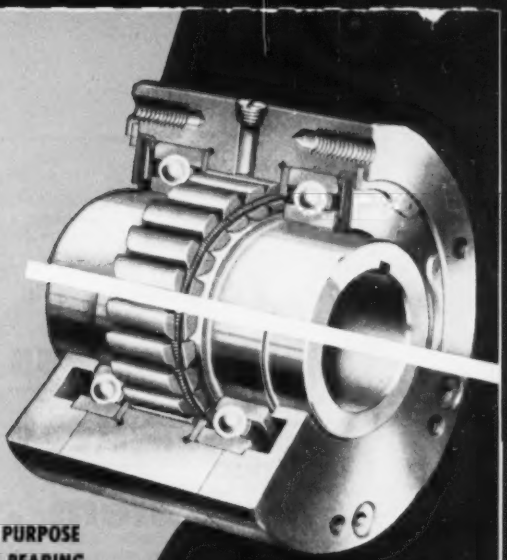
TELL US ABOUT *YOUR* APPLICATION
Should it be as small as this one for a duplicating machine . . .

or as large as this one for an oil well rig—you'll want THE CLUTCH THAT DELIVERS THE GREATEST TORQUE CAPACITY FOR ITS SIZE AND WEIGHT —*THAT'S FORMSPRAG.*

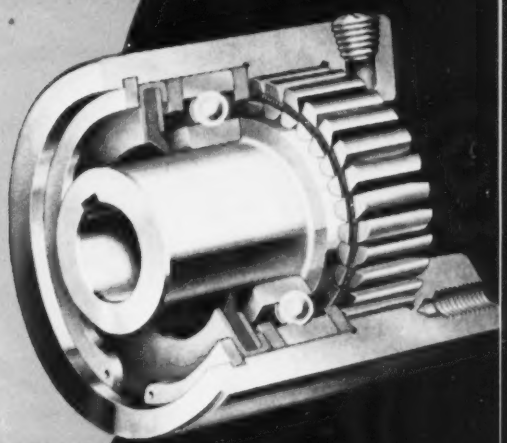




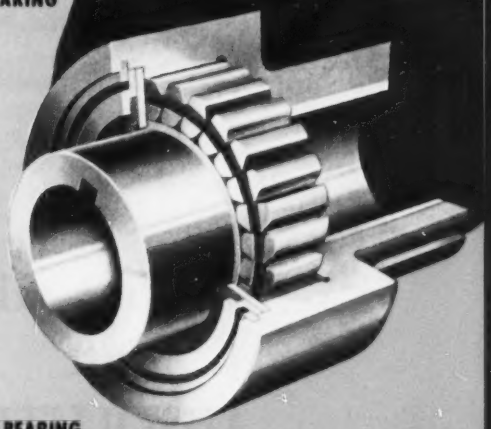
The infinite number of gripping positions available through sprag action makes possible this and other exclusive performance features like instantaneous operation with no backlash; internal simplicity; long life.



ALL PURPOSE BALL BEARING



SPECIAL PURPOSE BALL BEARING



PLAIN BEARING

Let Formsprag know today the performance you expect, the shaft size, the capacity, etc. If you don't have information on Formsprag clutches, send for it today with the coupon at right.

DISTRIBUTORS IN PRINCIPAL CITIES

Your inquiries about Balansprag and Cagedsprag Over-Running Clutches are welcomed by the Formsprag Company.



FORMSPRAG COMPANY
23609 Hoover Road, Van Dyke, Mich.

Send the Formsprag Folder to:

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

Tough centerless finishing problem . . . . . got you going in CIRCLES



Here's the grinding wheel that will ABSOLUTELY solve it!

CINCINNATI Grinding Wheels can help you straighten out that tough centerless finishing problem, *because CINCINNATI Wheels are made to team-up with centerless grinders.* And with a Cincinnati Milling-trained machinist on the spot to help you get the most out of CINCINNATI Grinding Wheels, you can count on the *right answer*—FAST!



CINCINNATI Grinding Wheels have solved hundreds of centerless grinding problems involving finish, roundness, taper, sizing and production.

Here's why CINCINNATI Wheels can help you:

1 CINCINNATI Grinding Wheels are used by—and *developed* by—Cincinnati Milling, which has done more research, had more experience and made more centerless grinders than any other organization in the world.

2 Using CINCINNATI Wheels, we've solved hundreds of centerless grinding problems—such as production, roundness, taper and sizing.

3 CINCINNATI Grinding Wheels represent 25 years of Cincinnati Milling research and practical experience based on an entirely new approach to grinding wheels—the development of the grinding wheel as a true cutting tool.



This problem really had production men in a whirl! Using just one grade of wheel, grind stainless bars and tubes ranging from ½" bars to 2" tubes and up to 12' long. For solution, see Case History.

How CINCINNATI GRINDING WHEELS Solved Tough Centerless Finishing Problem

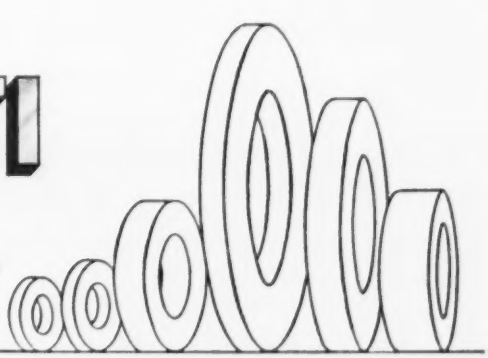
CASE HISTORY No. 419

The job	Grind 300 series stainless bars and tubes ranging in size from 5/32" bars to 2" tubes and up to 12' long.
The machine	Cincinnati No. 2 Centerless with Type C long bar attachment.
The problem	A single grade of wheel was needed that would handle a wide variety of sizes and types of stainless bars and tubes. Normally, several grades of wheels would be specified, but the quantities involved would make this usual procedure uneconomical.
The solution	Another notable solution to a difficult problem was found through the help of Cincinnati Grinding Wheels machinists, who studied the problem and discussed it with production and machine tool men. High production and acceptable tolerances, both for size and finish, were achieved by using a Cincinnati Wheel, 6GA6-L9-B2, silicon carbide grain, resinoid bond. However, the Cincinnati experts did more than simply prescribe the correct wheel. They also provided a schedule of feed rates, cut speeds and number of passes for each size and type of bar. All of this was carefully worked out on the spot by Cincinnati men to make the wheel produce at its best in every situation.

We are so confident—*so absolutely sure*—that CINCINNATI Grinding Wheels can help solve your tough centerless finishing problem that we make this *unconditional offer:* either you must be completely satisfied, or we will make no charge for the CINCINNATI Grinding Wheel used.

So, start the new year right—with the right answer to tough centerless finishing problems: CINCINNATI Grinding Wheels. Contact us at once. We'll send one of our expert machinists—men who are Cincinnati Milling-trained and know grinding and grinding machines as well as grinding wheels. He can show you how to get the most out of CINCINNATI Grinding Wheels and help you solve that tough centerless finishing problem. There is no charge for his service. Write, wire or phone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio



Unless your operators work for nothing...

The savings in time alone will pay for New

LELAND-GIFFORD DRILLING MACHINES

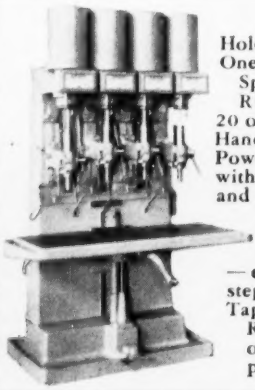
Convenient central controls, stepped-up speed, reduced work handling, built-in safeguards against costly errors, fast speed changes, quick adaptability to different jobs are some of the time-saving features of the new Leland-Gifford Drilling Machines which make it possible for the average operator to greatly increase machine production. And with the added advantage of higher precision, he can produce *better* work at the same time.

Leland-Gifford offers a complete line of motor spindle drilling machines — plus unsurpassed engineering skill and facilities for designing special tooling and adapting standard machines to meet any production drilling need. A Leland-Gifford field engineer can show you how to improve production and lower drilling costs with Leland-Gifford methods. Call the office near you.

No. 1LMS

Smallest holes up to 5/16"
Bench or floor types
One to Six Spindles
Speeds up to 10,800 RPM
12 or 20 inch Swing
Hand or Hydraulic Feed
Tapping by Friction
Tapping Attachment



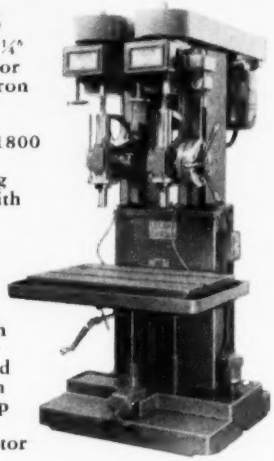


No. 2LMS

Holes from 1/16" to 3/4"
One to Six Spindles
Speeds up to 3600 RPM
20 or 26 inch Swing
Hand Feed;
Power Feed
with three feed rates and Positive, Adjustable Depth Stop; or Hydraulic Feed — either plain or step-by-step.
Tapping by Reversing Motor or Friction Tapping Attachment

No. 3MVB

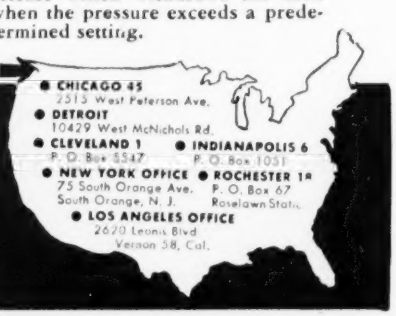
Holes up to 1 1/4" in Mild Steel or 1 1/2" in Cast Iron
One to Four Spindles
Speeds up to 1800 RPM
24 inch Swing
Power feed with three Rates, Adjustable Depth Stop and Safety Slip Clutch.
Also can be furnished with Hand Feed or Hydraulic Feed — either plain or step-by-step Tapping by Reversing Motor



HYDRAULIC FEED

Two types of hydraulic feed are available — the well-known step-by-step type for deep hole drilling; and a plain feed for shorter holes or reaming. With either type the feed rate is *infinitely adjustable* and *independent*, and the maximum thrust pressure may be regulated with an overload release which withdraws the drill when the pressure exceeds a predetermined setting.

SAVE DAYS — CONTACT THE OFFICE NEAREST YOU



LELAND-GIFFORD

Drilling Machines

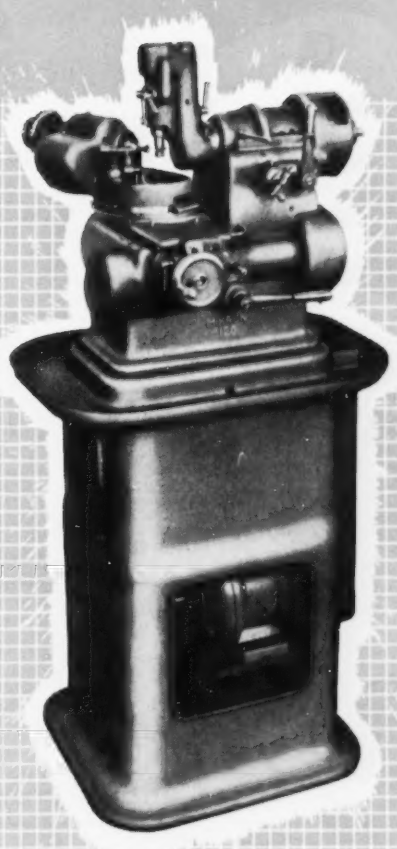
WORCESTER 1, MASSACHUSETTS, U.S.A.

For more information on products advertised, use Inquiry Card, page 247

THE ULTIMATE IN

BEVEL GEAR ACCURACY





- low-cost tooling
- simplicity of set-up

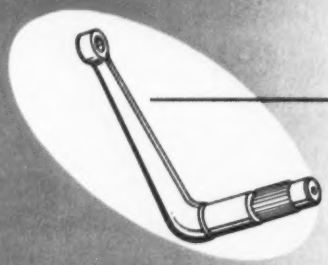
NO. 120 MIKRON

fine pitch

BEVEL GEAR HOBBING MACHINE

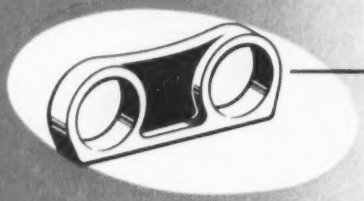
RUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.



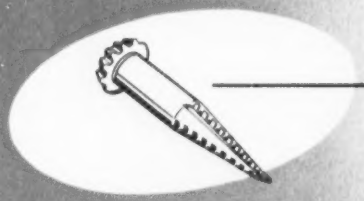
DETROIT BROACH TOOLS STEERING ARMS

Production costs took a sharp turn downward when Detroit Broach tooling started producing the spline on tractor steering arms. Teeth are produced in one machine cycle with simple tooling on an economical punch press.



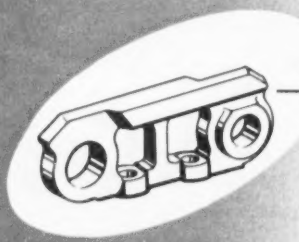
DETROIT BROACH TOOLS END PLATES

Accuracy climbed and costs slipped when Detroit Broach tooling finished the holes in track end plates. Two holes are machined at once, with accuracy well within specified production tolerances.



DETROIT BROACH TOOLS COTTON PICKER SPINDLES

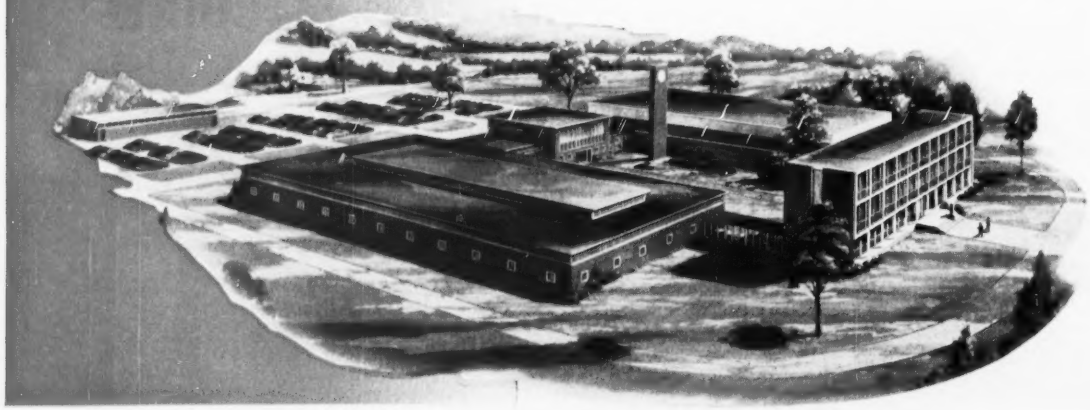
Consistent top notch quality is easy pickin' since Detroit Broach tooling started putting the "bite" on these spindles. Tooth spacing, size, and shape on each flute are consistently identical with important production economies, too.

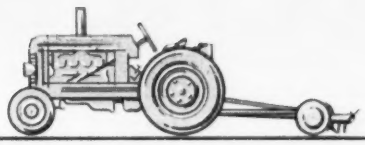


DETROIT BROACH TOOLS SIDE BARS

Broaching the holes in track side bars is another operation with better accuracy and lower costs since Detroit Broach tooling took over. Size, spacing, concentricity and squareness are within tolerance limits while achieving steady, high-output production quotas.

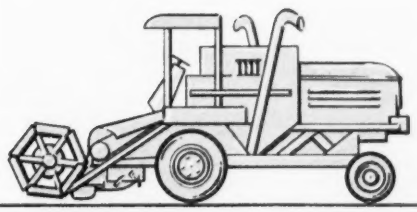
This is a view of the new, ultra-modern Detroit Broach plant and offices located in Rochester, Michigan—just outside Detroit. Designed by Sture Frolen, eminent Swedish architect, it embodies many important advancements that contribute to employee morale and manufacturing efficiency. Another example of the unusual facilities of Detroit Broach Company.





Broaching Pioneers

IN THE FARM EQUIPMENT INDUSTRY



Dependable, work-saving agricultural equipment, at a price practical for the majority of farmers, has accounted for the rapid growth of mechanized farming in the past twenty years.

And one of the important means which equipment manufacturers use to cultivate more production at lower cost is broach tooling from Detroit Broach. A few typical parts which Detroit Broach has tooled for agriculture are shown at the left.

in YOUR industry, too,

there are countless examples of Detroit Broach tooling that is helping to lower the boom on production costs. At the same time, it is tooling which consistently reaps a bumper crop of benefits in terms of closer tolerances with repetitive accuracy, good surface finishes, and low tool maintenance costs.

Chances are that Detroit Broach tooling can do the same for you! You can find out by simply contacting your local Detroit Broach representative or by dropping a line to the home office. There's no better time than right now to do it.

Detroit Broach COMPANY

ROCHESTER, MICHIGAN

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

TOMORROW'S

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE *Lo-swing* PEOPLE"** SENECA FALLS, NEW YORK

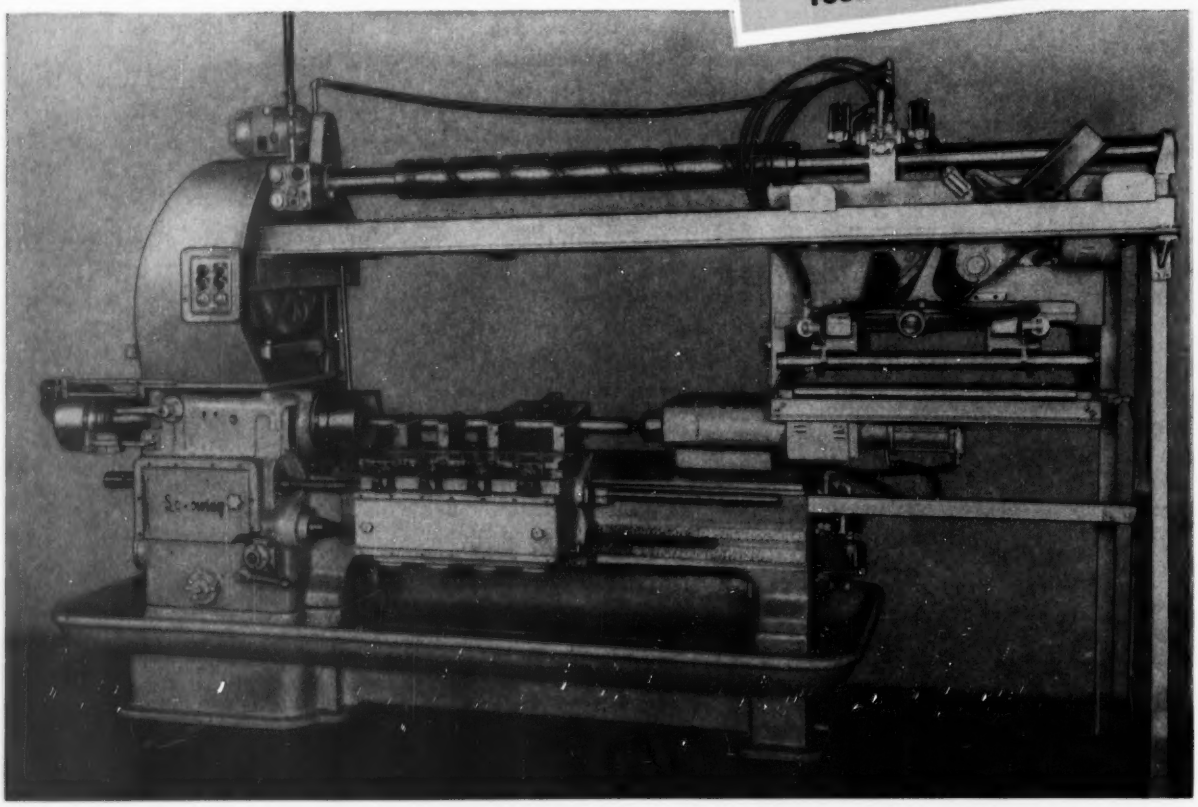
● While automatic loading of individual machines and groups of machines (transfer loaders) was developed by Seneca Falls engineers as early as 1928 and many such installations have been in continuous use for more than two decades, a challenging opportunity for plant automation still awaits American Industry.

Modern automatic machine tools have attained a high degree of productive efficiency within their cycle of operation. Now Industry must couple up the production flow with more efficient, less costly means of work loading and work transfer between automatic machines.

Seneca Falls, with a vast store of experience and a record of many successful installations, will help you find more cost-cutting methods for tomorrow's more competitive production. The Automatic Work Handling installations pictured on these pages show typical equipment in actual use. Your inquiries are invited.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

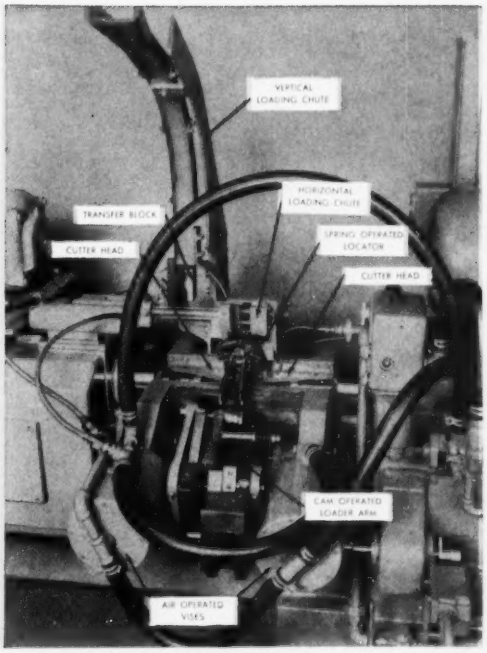
TO STAY IN BUSINESS, YOUR COSTS MUST BE AS LOW AS YOUR COMPETITORS'.



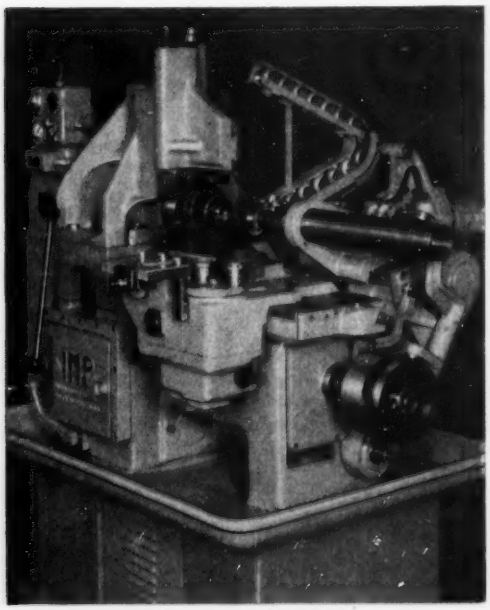
Model LR Lo-Swing Lathe equipped with Seneca Falls Automatic Work Loader and tooled for shaft work. A swinging cradle at the tailstock end of the machine connects with Work Transfer conveyors which feed rough work to the lathe and transfer finished work to other machines and gauging stations.

PRODUCTION COSTS

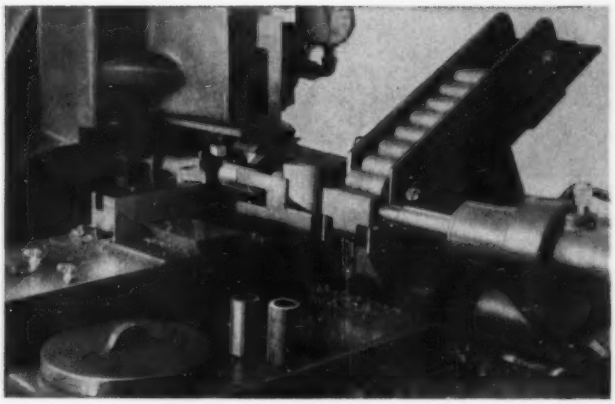
METHODS *are here!*



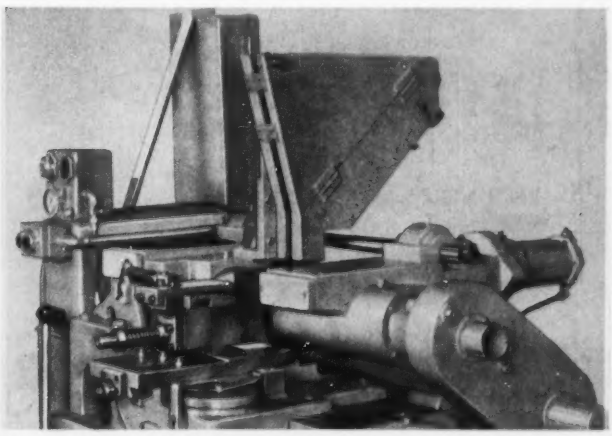
Automatically-loaded Model CS Lo-swing Automatic Drilling and Centering Machine equipped for chamfering bore on both ends of piston pins.



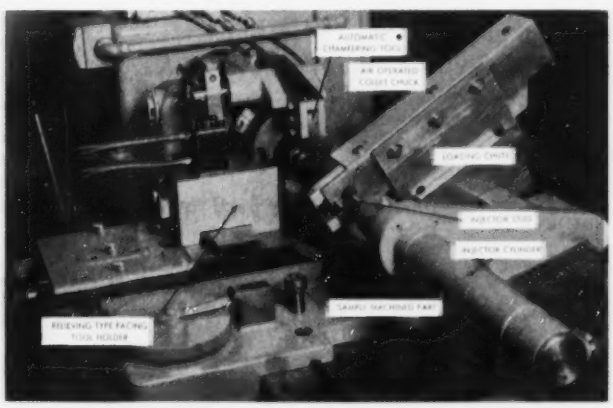
This Automatic Loader feeds fairly heavy couplings into a cradle where they are picked up by an injector head and chucked in an air operated collet chuck. Finished pieces are automatically ejected, picked up by a safety finger and dropped on the evacuation chute.



Automatically-loaded Lo-swing IMP turns and faces *both* ends of bronze bushings in a variety of lengths and diameters

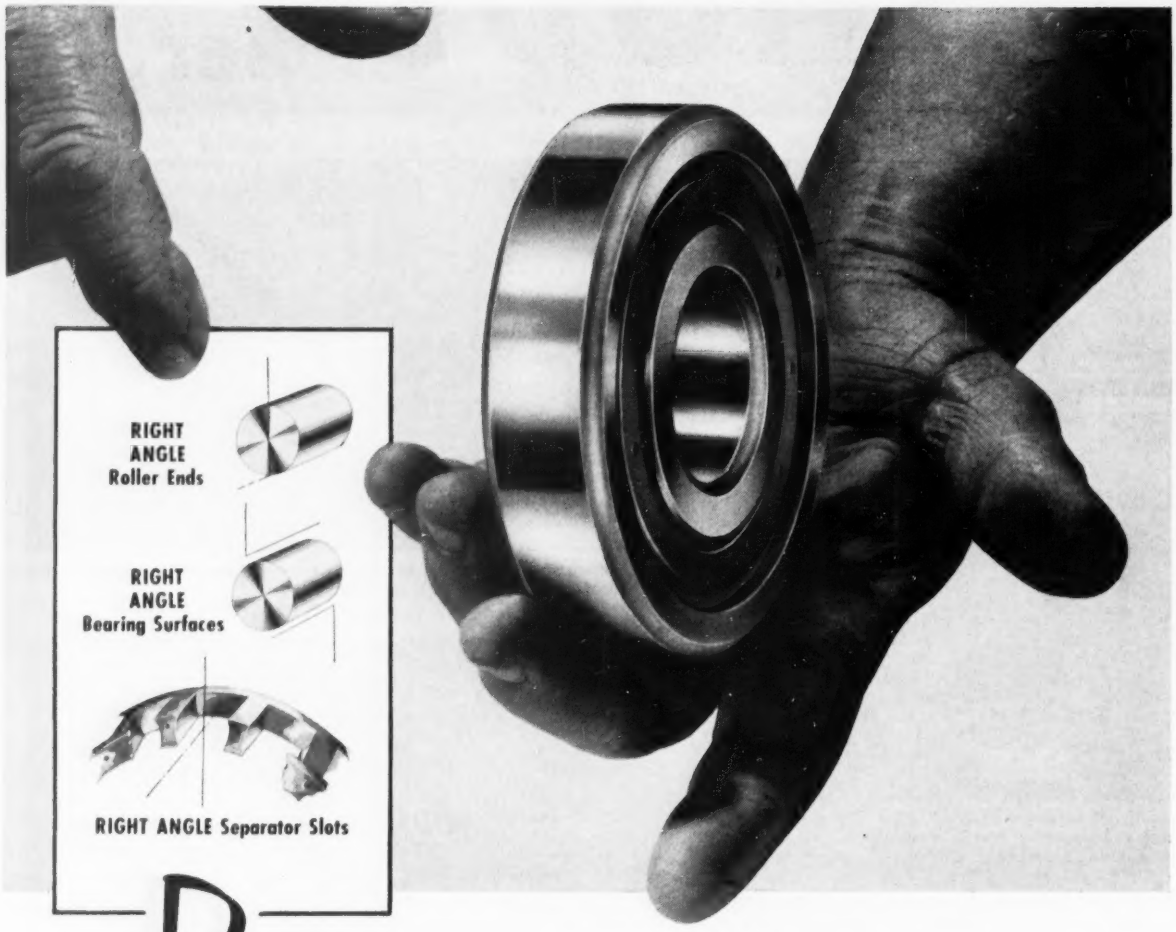


Hopper-fed, rotary loader automatically loads and ejects valve guides on a high production basis. Machine rough and finish turns.



Partially-machined pump gears feed by gravity to an injector arm which picks them up and places them in an air-operated collet chuck on this Automatically-loaded IMP Lathe.

ARE LOWER WITH *Lo-swing*



Right from every angle to bear heavier loads with less maintenance

The basic precision principle of right-angle design is translated by Rollway into a bearing that rotates with least friction under practically all heavy-load conditions.

Precisely-made ends, rollers and slots afford little opportunity for sliding friction, side-shock, end-rub or skew to cause premature failure.

Straight solid-cylindrical rollers provide the long line-contact necessary to support heavy loads. The use of special alloys restricts spalling or indentation of the race.

The net result is a bearing that stands up—longer—with far less maintenance and replacement.

In the heavy-duty equipment field, Rollway Bearings are recognized for their long, trouble-free service life. Whether you're a maker or a user, you'll *"roll right with Rollway."* Rollway Bearing Co., Inc., Syracuse, N. Y.

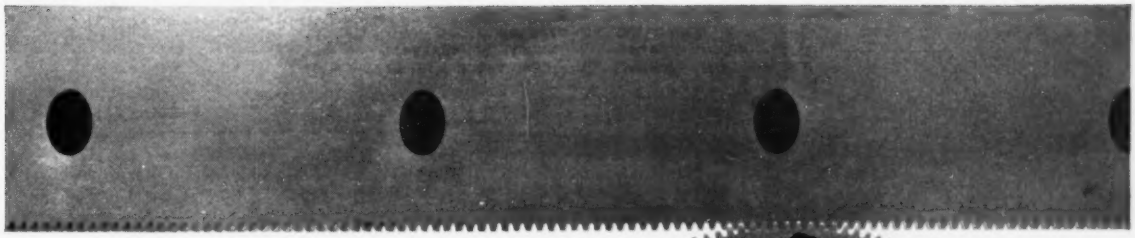
Write or call your nearest Rollway office:

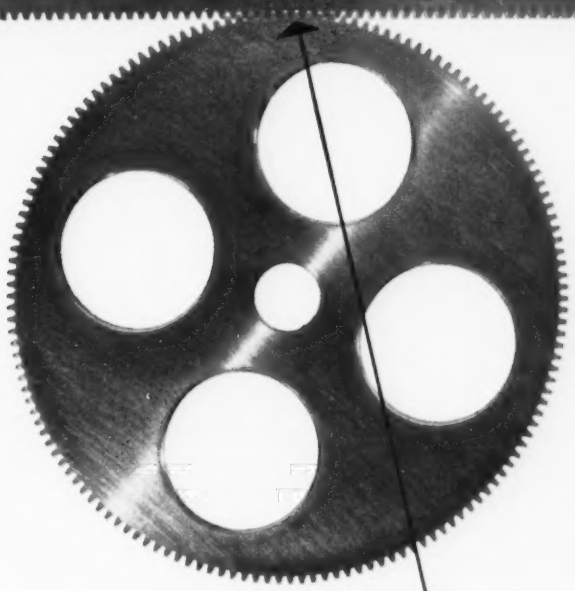
Boston	Chicago	Los Angeles
Detroit	Houston	Pittsburgh
Milwaukee	Philadelphia	San Francisco
Syracuse	Toronto	Seattle
	Cleveland	

Rollway Bearing replacements are available through authorized bearing distributors in principal cities. Consult your classified 'phone directory.

ROLLWAY
BEARINGS
Complete Line of Radial and Thrust Cylindrical Roller Bearings

For more information on products advertised, use Inquiry Card, page 247





Why you can *reduce rejection losses* with a Kodak Conju-Gage Gear Checker

Why the composite check

In practice, the final test of gear quality is how the gear works in use. The composite check recommended in American Standard B6.11-1951 shows this conclusively by measuring displacement of the gear when run against a master of known accuracy. And it does it in one quick operation that checks combinations of as many as six types of errors.

Why the Conju-Gage Gear Checker

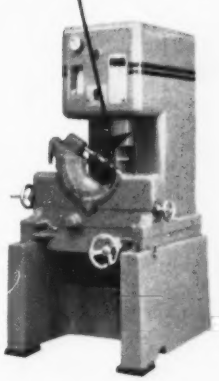
Since displacement represents the sum of both gear error and error in the master, the accuracy of the master used determines the precision of the composite check. The Kodak Conju-Gage Gear Checker uses a master of exceptional accuracy, the Conju-Gage Worm Section. Produced by thread grinding, its accuracy is not limited by the same manufacturing processes which limit accuracy in the gear itself.

To settle for masters of lesser accuracy is to rob yourself of "tenths"—to chance that tolerable error in a gear may coincide with error in the master to cause a needless rejection. Or that intolerable error in a gear may be cancelled by error in the master to pass a gear that will fail in use.

To reject every wrong gear is to guard the quality of your product. To pass every right gear is to reduce such rejection losses to a minimum.

To find out more about how a Kodak Conju-Gage Gear Checker can lower costs while maintaining required precision, send for your copy of the booklet, "Kodak Conju-Gage Gear Testing Principle." Write to

Special Products Sales Division
EASTMAN KODAK COMPANY, Rochester 4, N.Y.



The Kodak Conju-Gage Gear Checker automatically records the composite effects of runout, base pitch error, tooth thickness variations, profile error, lead error, and lateral runout. Illustrated is the Kodak Conju-Gage Gear Checker, Model 8U, for gears up to 8¼" pitch diameter. Smaller models are also available.

CONJU-GAGE INSTRUMENTATION

... a new way to check gear precision in action

To inspect all kinds of complex parts on a bright screen, Kodak also makes two highly versatile contour projectors.

Kodak
TRADE-MARK


How C.P.C.*
CLEARING

Can Help Boost Your Productivity

As every manufacturer knows, the one way to beat today's profit squeeze—and tomorrow's—is to make each man-hour of labor, each unit of area, each dollar of investment, more productive. It's not a matter of whip-cracking. It is simply a matter of planning, based on accurate, up-to-date knowledge and experience.

Very often that planning involves a basic change in method. For example, many Clearing presses today are making parts which were formerly cast or machined from solid. Modern press methods are pointing the way to important savings in the manufacture of heavy section parts—substantial savings in man-hours and material as well, since press methods utilize practically all of the original metal.

Clearing presses are everywhere recognized as important elements in the battle for greater productive efficiency. Clearing Machine Corporation has accumulated a central store of information, of know-how, to help any industrial concern, large or small, *attain more output per dollar.* That is the objective of C.P.C. — *Clearing Productivity Consultation.

This service is available to you without obligation. If you make large quantities of anything out of metal, you can profit from a Clearing Productivity Consultation.

For a Better Profit Position Tomorrow — Put Your Problem up to C.P.C.* Today

*Clearing Productivity Consultants have years of experience in their specific fields of press metalworking. If you plan to produce deep drawn parts, for example, a C.P.C. engineer can show you how the performance of a Clearing double action press can step up production to give you more than half again the output expected from conventional equipment. The problems presented by blanking and forming operations have been dealt with by these men in literally hundreds of installations throughout the country.







There is a C.P.C. to work with you on matters of closed die forgings — to discuss methods which can substantially reduce labor costs, and to go into details of temperature and physicals too. In the relatively new field of press extrusions, Clearing consultants can help you plan to produce heavy section parts, accurate to dimension, that can eliminate or materially reduce finish machining operations.



Improved Clearing hydraulic systems have simplified maintenance and operation. Increased efficiency in feeding—simplification of the die problem with rubber pad forming—are matters Clearing consultants regularly deal with. New methods of combining operations with transfer feed presses may be the way to cut labor and equipment costs. A Clearing Productivity Consultant in this field, as in all the others, is ready to help you plan today for a stronger profit position tomorrow.



CLEARING PRESSES

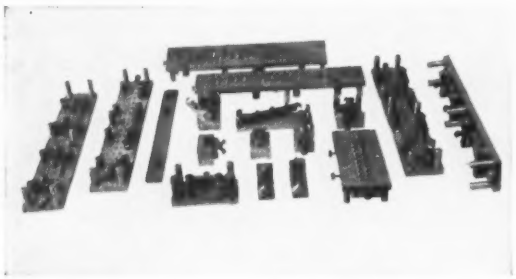
THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION ★ 6496 West 65th Street, Chicago 38, Illinois ★ HAMILTON DIVISION, Hamilton, Ohio

YOU GET *SPEED* PLUS ACCURACY WITH MOORE JIG BORERS

IN THE TOOLROOM

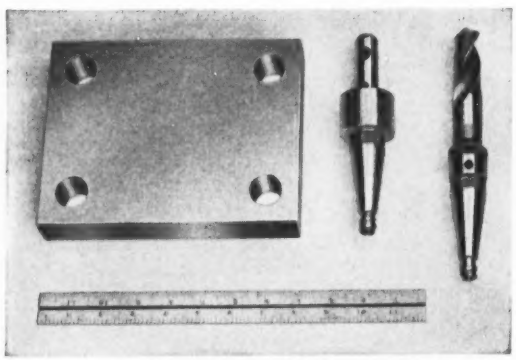
400 holes to "tenths"—5 to 7 minutes each on the No. 1 Moore Jig Borer



Manufacture of this group of drill jigs involves accurately locating, drilling and boring approximately 400 holes. The No. 1 Moore Jig Borer finished them to "tenths" in from five to seven minutes per hole.

ON PRODUCTION

64 holes to ±.0002"—2 minutes each on the No. 2 Moore Jig Borer

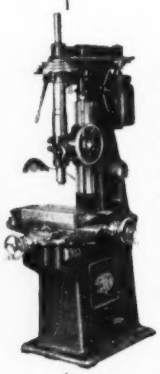


Sixteen pieces like this were located, drilled, bored and checked on a No. 2 Moore Jig Borer with one drill and one carbide bit. The 64 holes were finished in 2 hours and 8 minutes (plus 30 minutes setup) with location and size tolerances ± .0002".

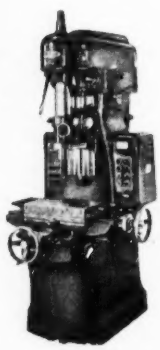
Only a precision machine geared to the high American production standards of ruggedness *and* accuracy can meet these performance requirements. For versatility and speed in spotting, drilling, reaming, boring and checking operations in production as well as tooling, no other moderately-priced machine tool compares with the Moore Jig Borer. And there's no sacrifice of accuracy for speed, since the lead screw measuring system built into each Moore machine permits working to the closest of tolerances.

You'll find that the Moore Jig Borer can pay for itself—*in jig time*. Write today for detailed bulletins.

Moore Special Tool Company, Inc.
734 Union Avenue, Bridgeport 7, Conn.



NO. 1 MOORE JIG BORER
Table working surface of 10"x16". Over 1200 now in use throughout the world. The ideal small, accurate jig borer. Lead screws accurate to .0002" in 16".



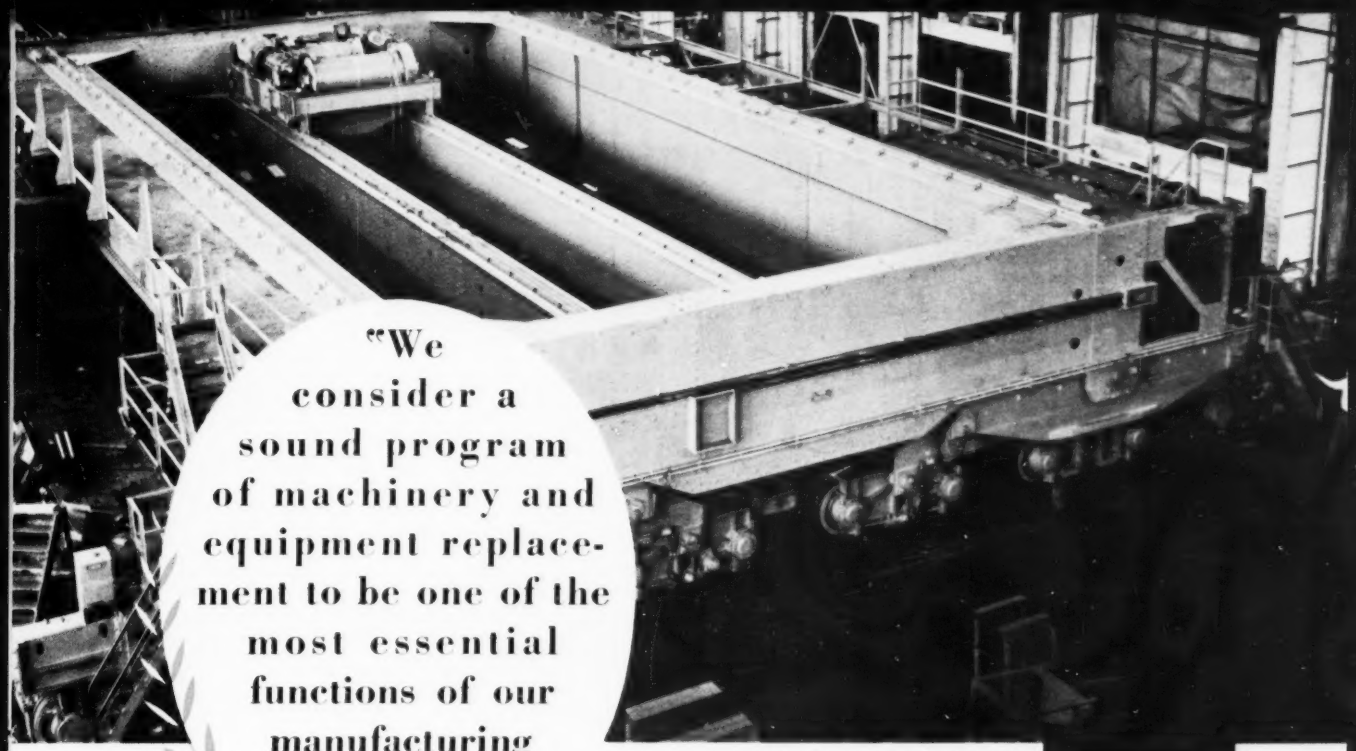
NO. 2 MOORE JIG BORER
Table working surface of 10"x19". Heavier cuts, larger holes. Features infinitely variable spindle speeds, three power feed ratios, centralized control panel.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

see our catalog in MACHINE TOOL CATALOGS or write for copy

For more information on products advertised, use Inquiry Card, page 247



"We consider a sound program of machinery and equipment replacement to be one of the most essential functions of our manufacturing operation"

Ladle Crane on Erecting Floor of Morgan Engineering Company



WILLIAM H. MORGAN, *President*
THE MORGAN ENGINEERING CO.

"The Morgan Engineering Company, with an eighty-five year history as a leading manufacturer of large overhead electric cranes, charging machines, ingot stripping cranes, soaking pit cranes, gantry cranes, heavy rolling mill equipment, shearing equipment, steam hammers and forging presses, and other heavy equipment, has a high regard for the necessity of an adequate machinery and equipment replacement policy.

"Articles of our corporate policies state, "It shall be the policy of The Morgan Engineering Company (1) to recognize the responsibility of management and employees to the shareholders whose investment provides the personnel with the necessary physical facilities for efficient operation, and (2) to provide and maintain the necessary facilities and equipment that will enable operations to be conducted at maximum effectiveness and economy.

"Since the founding of The Morgan Engineering Company the demand for larger and heavier products has steadily increased. To meet this demand we consider a sound program of machinery and equipment replacement to be one of the most essential functions of our manufacturing operation. We find that the MAPI Formula adapted to the special requirements of our company, provides us with factual information to justify our replacement program.

"As producers of capital equipment, we advise our customers on maintenance and replacement — we believe in practicing what we preach."

ROCKFORD INSERT GROUP

Keep Gathering Metal-Working Production Ideas...Be Well Informed When The Time For Replacement Arrives . . . . . .

January, 1954

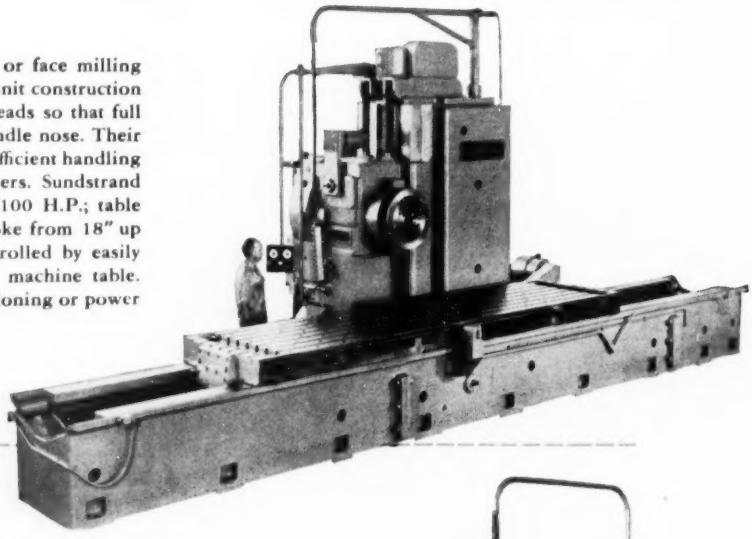
You'll Get Better Methods, Lower Costs from SUNDSTRAND "Engineered Production" and Equipment...

These standard basic Sundstrand Rigidmils can, and have been, tooled in various ways to lower production milling costs. Countless plants using these machines with Sundstrand "Engineered Production" methods and accessories have found these machines most productive and economical. Call in a Sundstrand engineer to assist you with your milling problems. There is no obligation for this service.

ON BIG, SMALL, SIMPLE OR COMPLICATED MILLING JOBS

SIMPLEX RIGIDMILS

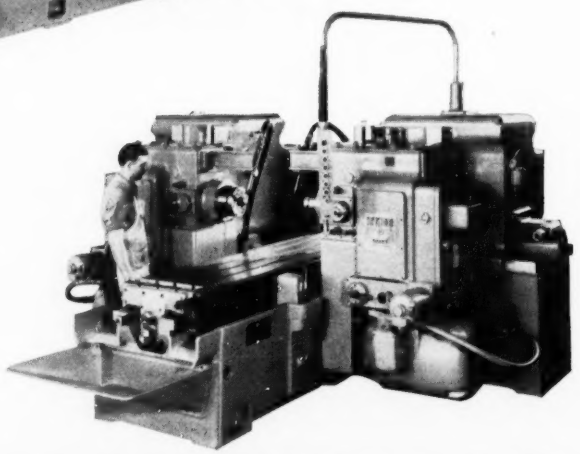
Sundstrand Simplex Rigidmils perform slab or face milling operations with one spindle. They are of the unit construction type and have independently motor driven heads so that full horsepower rating of head is delivered at spindle nose. Their extremely wide speed and feed range permits efficient handling of many different materials and sizes of cutters. Sundstrand Simplex Rigidmils range in size from 3 to 100 H.P.; table size from 10½" up to 48" wide and feed stroke from 18" up to 216". Table cycles are automatically controlled by easily adjusted dogs mounted on the front of the machine table. All models can be furnished with power positioning or power feed to the head as extra equipment.



DUPLEX RIGIDMILS

Parts with opposed faces can be machined much more accurately and economically on Duplex Type Rigidmils. These machines, having the same basic features as the Simplex, are made with fixed columns or with adjustable columns.

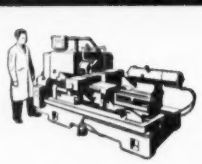
The fixed column type machine has endwise adjustment of the spindle quills only. The adjustable column type provides maximum cutting rigidity over a much wider range for milling both wide and narrow work pieces. The Model O size has manual adjustment for column positioning, while Models 33 and 55 have power movement. Other sizes available on request.

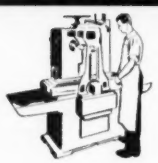


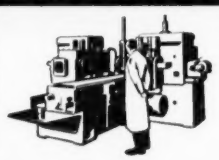
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

SUNDSTRAND "Engineered Production" Service*

*REG. U.S. PAT. OFF.







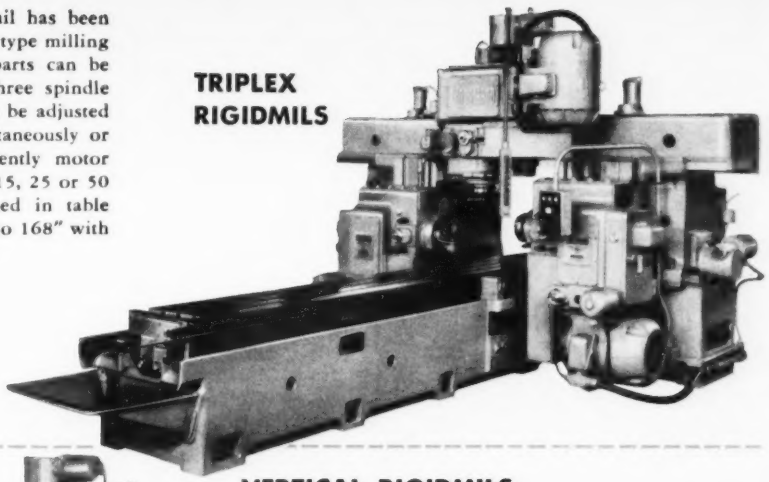
MADE IN ROCKFORD... TESTED ENGINEERING AND CRAFTSMANSHIP ILLINOIS, U.S.A.



Machinery, January, 1934

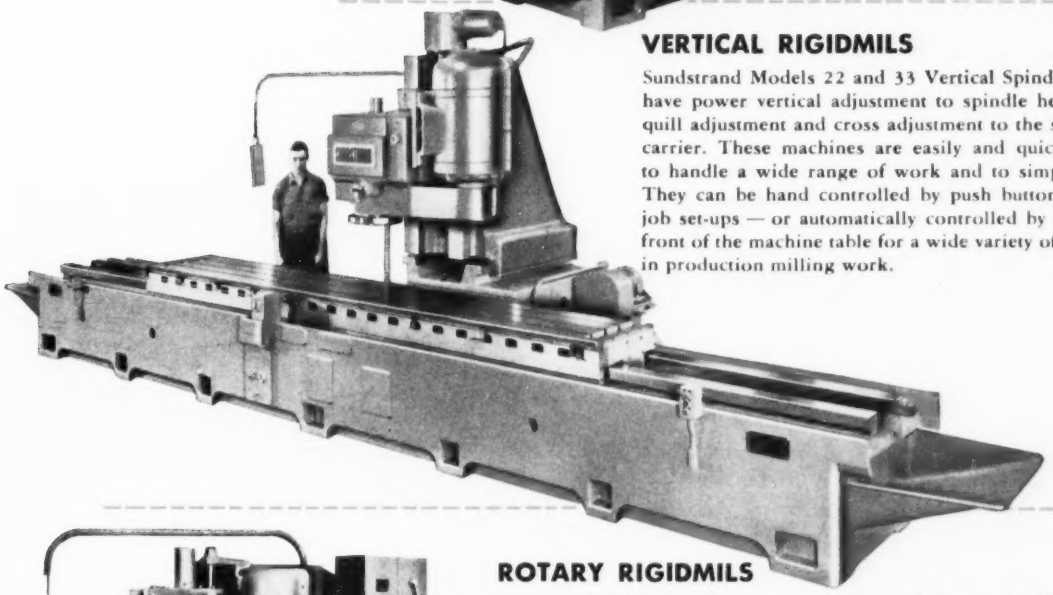
This highly productive Sundstrand Rigidmil has been developed to add flexibility to a production type milling machine so that both wide and narrow parts can be machined without sacrifice in accuracy. Three spindle heads, one vertical and two horizontal, can be adjusted to mill three sides of a work piece simultaneously or operate individually. Heads are independently motor driven and each can be furnished in either 15, 25 or 50 H.P. capacities. Machines can be furnished in table widths of 24" and 30" and feed strokes up to 168" with larger or special sizes available on request.

TRIPLEX RIGIDMILS



VERTICAL RIGIDMILS

Sundstrand Models 22 and 33 Vertical Spindle Rigidmils have power vertical adjustment to spindle head, endwise quill adjustment and cross adjustment to the spindle head carrier. These machines are easily and quickly adjusted to handle a wide range of work and to simplify set-ups. They can be hand controlled by push buttons for single job set-ups — or automatically controlled by dogs on the front of the machine table for a wide variety of table cycles in production milling work.





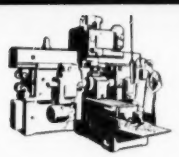
ROTARY RIGIDMILS

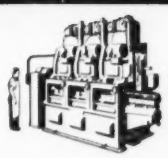
Sundstrand Rotary Rigidmils are available in three standard sizes with 36" and 48" diameter tables. They have way type cross adjustment of the spindle head carrier and way type vertical adjustment to the spindle head to provide maximum cutter support for either large or small parts. The adjustable swinging pendant permits easy access to the machine controls from any operating position. Power adjustment is optional for both the spindle head and the spindle head carrier.

Free Data Free Data on each of these Sundstrand Rigidmils is available on request. Complete specifications are included. Ask for bulletin No. 639.

SUNDSTRAND
Machine Tool Co.
2530 Eleventh St. • Rockford, Ill., U.S.A.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





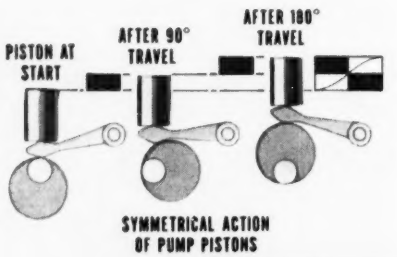


MADE IN
FOR PRODUCTION MACHINE TOOLS IT'S...ROCKFORD
ILLINOIS, U.S.A.

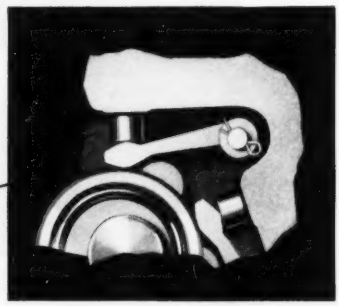
alone

BARNES closed fluid circuit and control

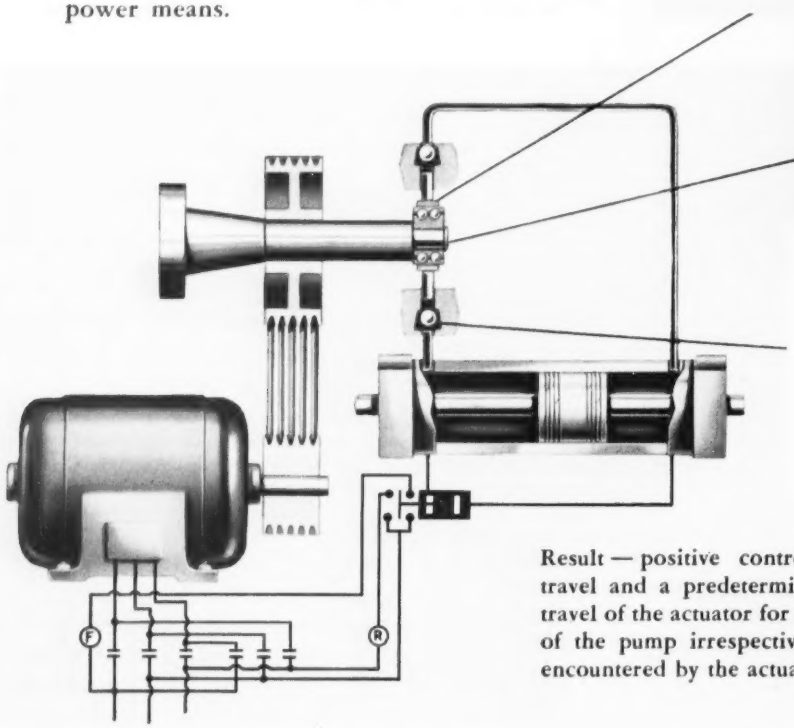
Fluid circuit and power drive consist of an actuator; a variable displacement pump for propelling the actuator at selected speeds; sealed ducts leading from the actuator to the pump and from the pump to the actuator; electrical power means for rotating the pump in one direction or the other; and synchronous means for controlling the electrical power means.



SYMMETRICAL ACTION OF PUMP PISTONS







Result — positive control of actuator travel and a predetermined amount of travel of the actuator for each revolution of the pump irrespective of resistance encountered by the actuator.

BRANCH OFFICES

503 New Center Building
Detroit 2, Michigan

3254 Lincoln Avenue
Chicago 13, Illinois

132 East Hanover Street
Trenton 8, New Jersey

SALES REPRESENTATIVES

Rees Machinery Company
1012 Empire Building
Pittsburgh 22, Pennsylvania

B. W. Rogers Company
850 South High Street
Akron 9, Ohio

Standard Machine & Tool Co.
870 Ottawa Street
Windsor, Ontario, Canada

Copyright 1953 by John S. Barnes Corporation

JOHN S. BARNES CORPORATION • ROCKFORD, ILLINOIS

MADE IN
ROCKFORD...FOR ACCURATE, FAST METAL REMOVAL
ILLINOIS, U.S.A.



Anderson

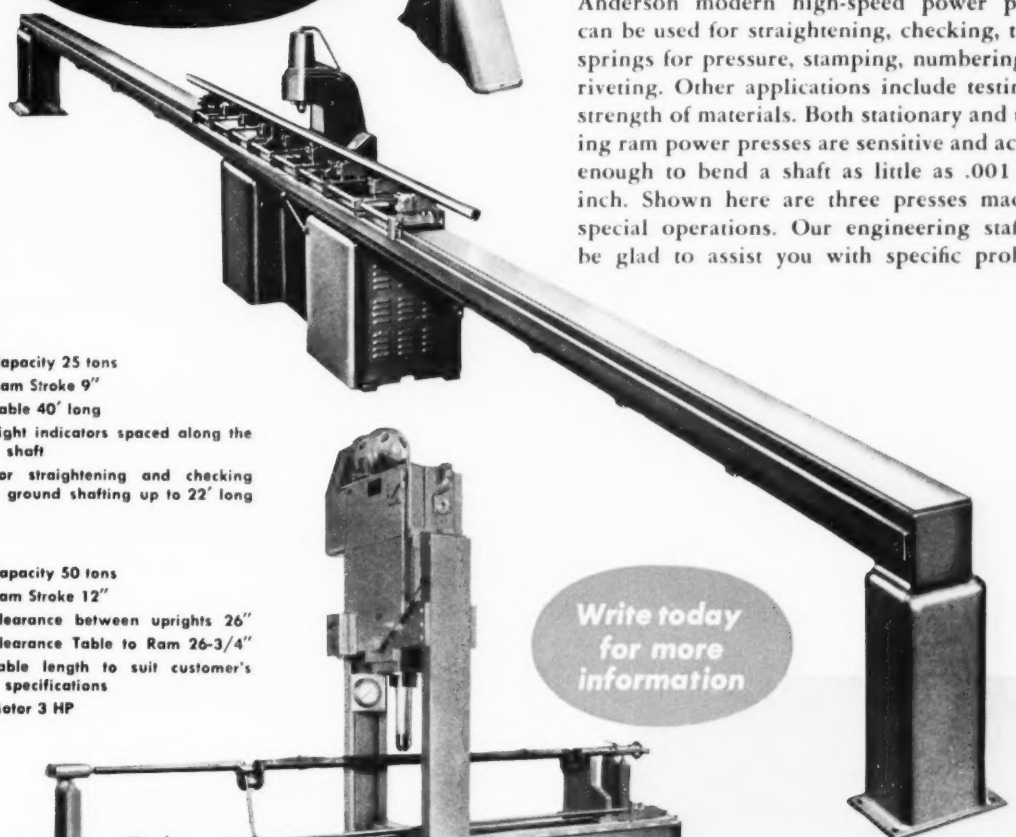
HYDRAULIC POWER PRESSES

FOR Straightening Checking Truing



Capacity 50 tons
Ram Stroke 6"
Clearance Between Uprights 20"
Clearance Table to Ram 20½"
Floor to Table Top 30"
Motor — 3 HP 3 phase 60 cycle

Anderson modern high-speed power presses can be used for straightening, checking, testing springs for pressure, stamping, numbering, and riveting. Other applications include testing the strength of materials. Both stationary and traveling ram power presses are sensitive and accurate enough to bend a shaft as little as .001 of an inch. Shown here are three presses made for special operations. Our engineering staff will be glad to assist you with specific problems.



Capacity 25 tons
Ram Stroke 9"
Table 40' long
Eight indicators spaced along the shaft
For straightening and checking ground shafting up to 22' long

Capacity 50 tons
Ram Stroke 12"
Clearance between uprights 26"
Clearance Table to Ram 26-3/4"
Table length to suit customer's specifications
Motor 3 HP

Write today for more information

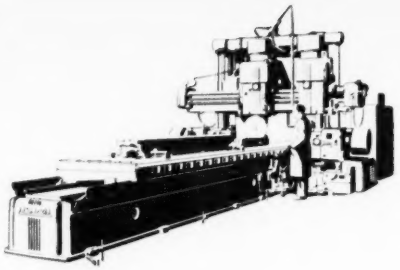
ANDERSON BROS. MFG. CO.
ROCKFORD • ILLINOIS



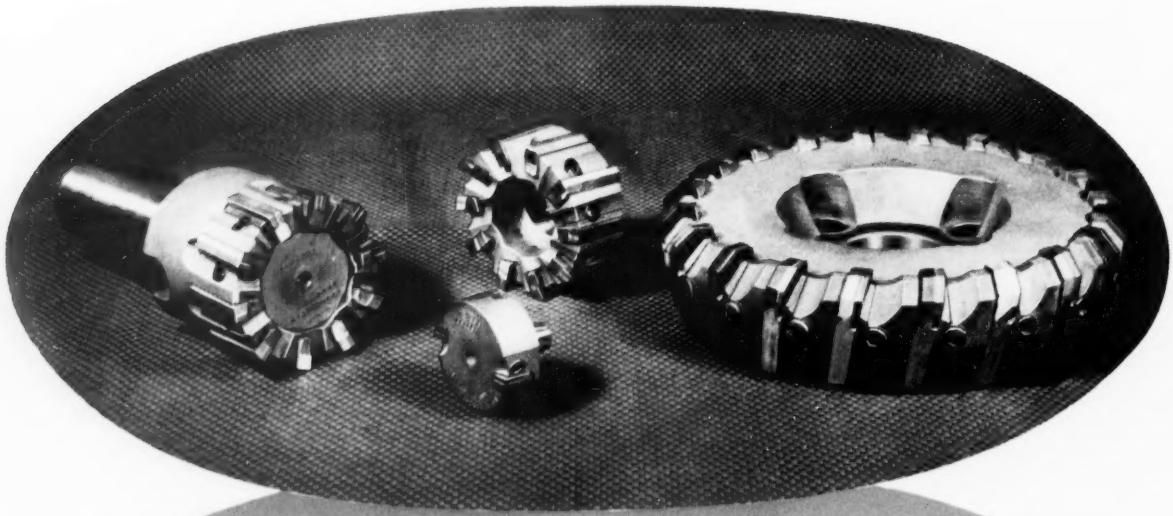
MADE IN
YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN... ROCKFORD
ILLINOIS, U.S.A.

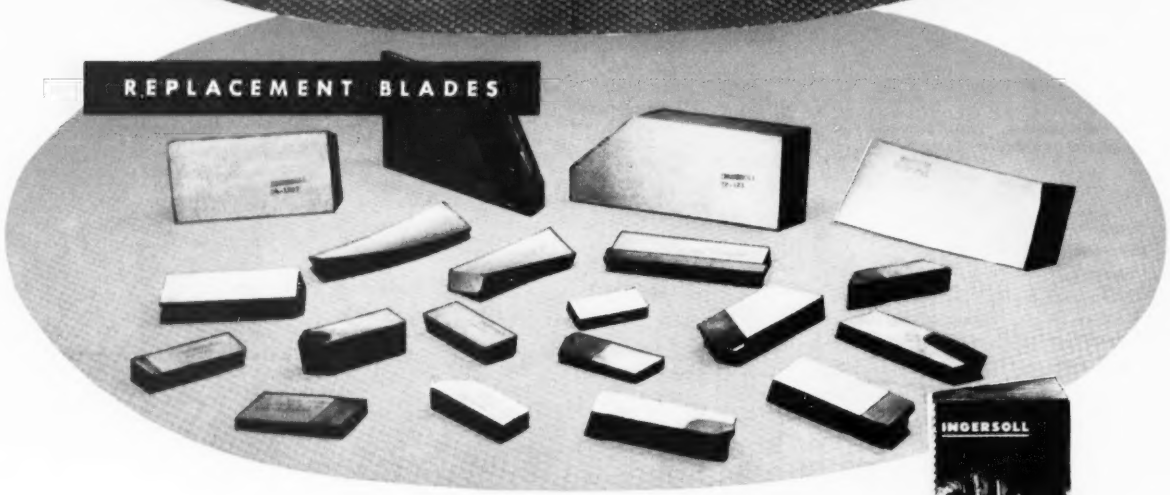
DO YOU CONSIDER THE COST OF REPLACEMENT BLADES WHEN BUYING CUTTING TOOLS?

In one year, a milling cutter in active service uses blades costing more than the original price of the cutter. *We furnish seven sets of replacements for each set of blades sold as original equipment.*



Ingersoll cutters offer the combined advantages of superior performance and substantial long-term economies in blade costs. The cost of Ingersoll blades is low because their design is simple and they are manufactured with good production equipment.





WRITE FOR Catalog 60B, describing Ingersoll Inserted Blade face mills, end mills, helical slab mills, side mills, arbor cutters, angular cutters, and boring heads.

THE INGERSOLL MILLING MACHINE COMPANY
ROCKFORD, ILLINOIS, U.S.A.

BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES
ORIGINATORS OF SHEAR CLEAR CUTTERS

MADE IN
ROCKFORD...MACHINE TOOL SHOPPING CENTER
ILLINOIS, U.S.A.



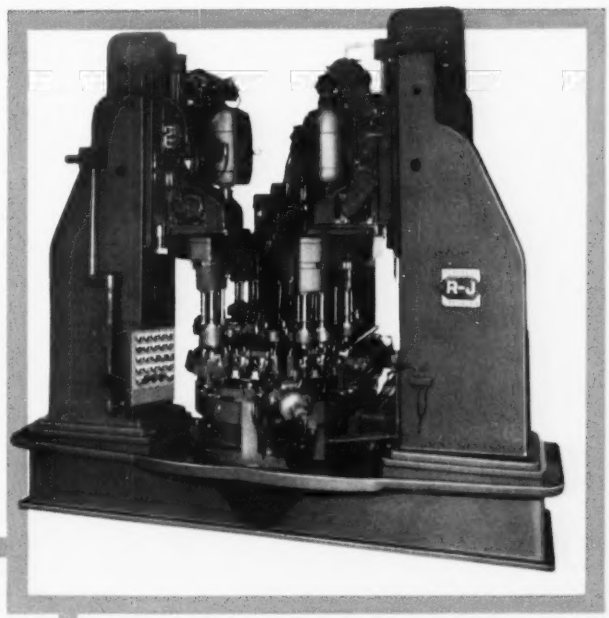
Rehnberg-Jacobson

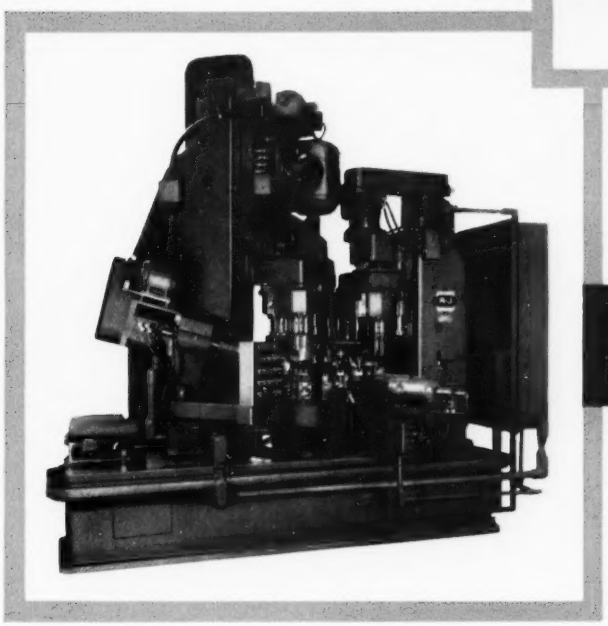
SPECIAL MACHINES FINISH AUTO PARTS

These two machines, functioning in sequence, perform all the operations on front suspension sockets for one of the new-model automobiles. The first machine takes four cuts at the socket bowl and rim, and combination spot drills and faces three holes on the shank. The second machine drills these three holes, faces the other sides of three pads, and drills and taps a grease fitting hole in the side of the socket.

TWO LINES—TWO PARTS

The parts come in rights and lefts, so there is a "line" of machines for each with certain units rearranged to take care of non-symmetrical operations. Also, the second set of operations requires two duplicate machines to keep up with the first. Thus there are a total of eight machines in the two lines. Each fixture carries two parts.







One of the suspension sockets is shown at the left, in rough form and in finished form. Note that operations in the bowl require the forming of a smooth hemispherical socket, a ledge, a straight-walled portion, and a chamfered lip.

ALL-MECHANICAL
UNITS ON R-J MACHINES

In response to a widely-expressed demand, R-J machines employ ALL-MECHANICAL Index, Drill, Tap, and Screw-Feed (multiple-spindle) self-contained Units. These units are found to be most easily *understandable* as to function and adjustment by operating and maintenance personnel. When you want sound, simple machines that can do *good* work — consider Rehnberg-Jacobson.

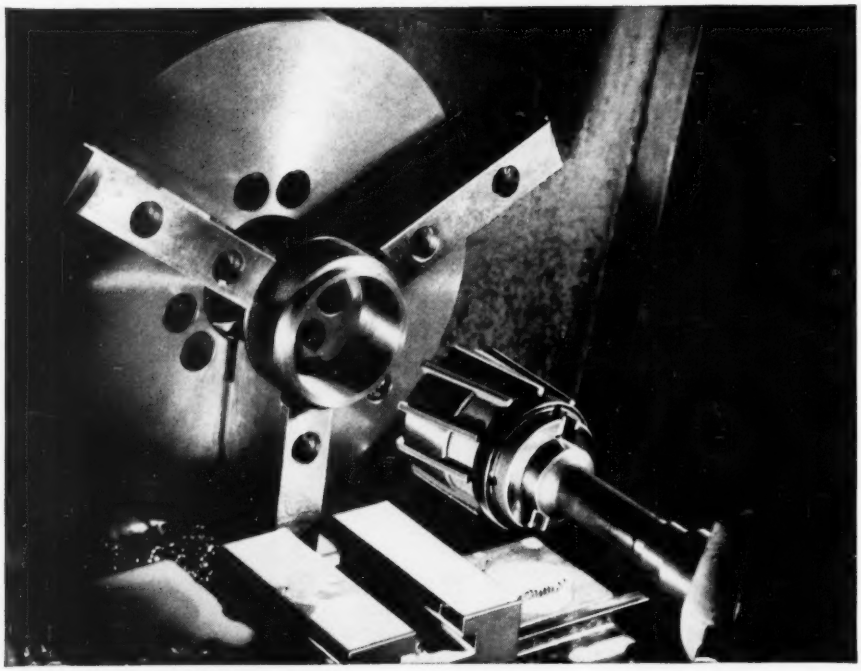
REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY

2135 KISHWAUKEE ST. ROCKFORD, ILLINOIS



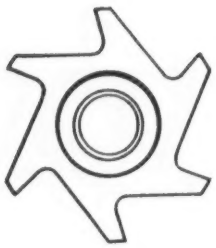
MADE IN ROCKFORD MADE MEANS PRECISION MADE...ROCKFORD ILLINOIS, U.S.A.



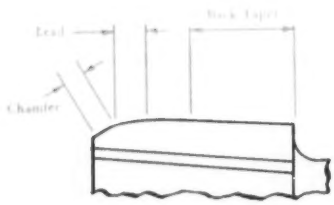
REAMER DESIGN Controls

Accuracy, Finish and Production

Barber-Colman Reamers produce finishes which were not previously considered possible on a standard production operation. Exceptional accuracy and tool life are also obtained on production runs as a result of the special features of Barber-Colman Reamers. Both solid-fluted and inserted-blade reamers are available.



Irregular flute spacing provides a smooth cutting action and fine finish, and helps to prevent the reamer from forming "welts". As a standard feature on all Barber-Colman Reamers, flutes or blades are spaced diametrically opposite each other so that they are easily checked with a micrometer.

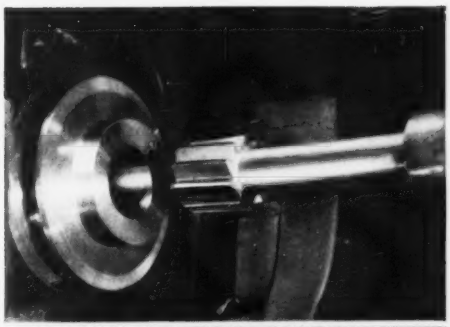


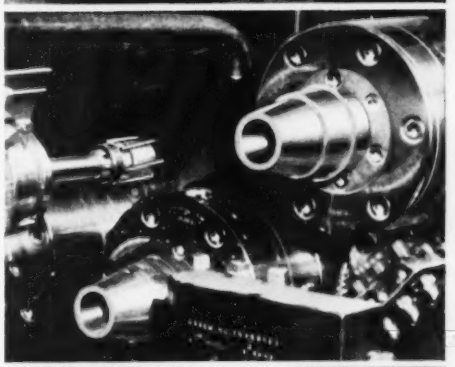
The profile form on Barber-Colman Reamers is designed to produce the best possible finish and tool life. Following the chamfer, the lead is blended into a radius to produce exceptionally fine finishes. Through Barber-Colman cam-controlled sharpening, a sharp cutting edge, rather than a cylindrical land, is produced, resulting in a freer cutting action. With this control, successive reamers are sharpened with exactly the same profile form and relief angles to provide exact duplication of size, straightness and roundness.

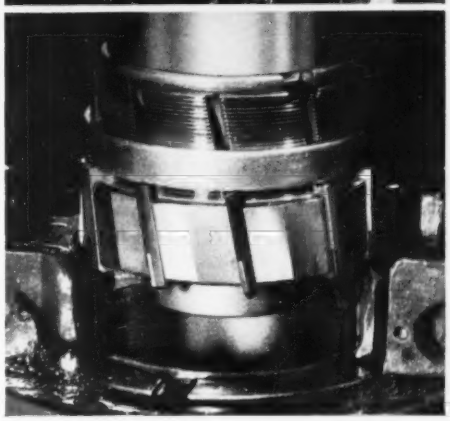
DESIGNERS OF STANDARD AND SPECIAL

MADE IN
ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS
ILLINOIS, U.S.A.









20-25 micro-inch finish typical

On this job, 1000 pieces are reamed to a surface finish of 20-25 micro-inches before it is necessary to re-sharpen the reamer. The feed is 1.75″ per minute at 280 rpm., requiring 30 seconds to ream the ⅞″ length of cut. Material is AISI C1137 steel.

1500 pieces per sharpening

This carbide-tipped inserted-blade reamer produces from 1100 to 1500 pieces per sharpening while maintaining the finish better than 60 rms. Tolerance on hole size is .002″. Stock removal is .012″ to .015″ on the diameter, and the material is B1117 steel. Speed is 105 sfm, and the feed is .0188″ per revolution. A Barber-Colman Reamer Sharpener reproduces the correct profile on the reamer blades with each sharpening.

tool cost reduced from $1.57 to $1.32

These Barber-Colman Reamers are producing truck cylinder liners with accurate straight round holes free from welts or taper at a tool cost 15% less than previous records. Material is cast iron. Replaceable blades with carbide tips give long reamer life and cutting edges which stand up under continuous production. 675 more pieces per set of blades are now obtained, and tool cost per 100 liners has been reduced from $1.57 to $1.32.

If you are now choosing between accurate, quality-finish reamed holes — and low-cost production and tool maintenance — you can have both, using Barber-Colman Reamers. More flutes per cutting diameter, solidly backed cutting edges, and standard irregular flute spacing will give you tool room reaming quality under regular production conditions.

Send specifications on hole sizing and finishing problems to Barber-Colman engineers. They will furnish reamers for your particular requirements to give you the desired quality consistently.

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

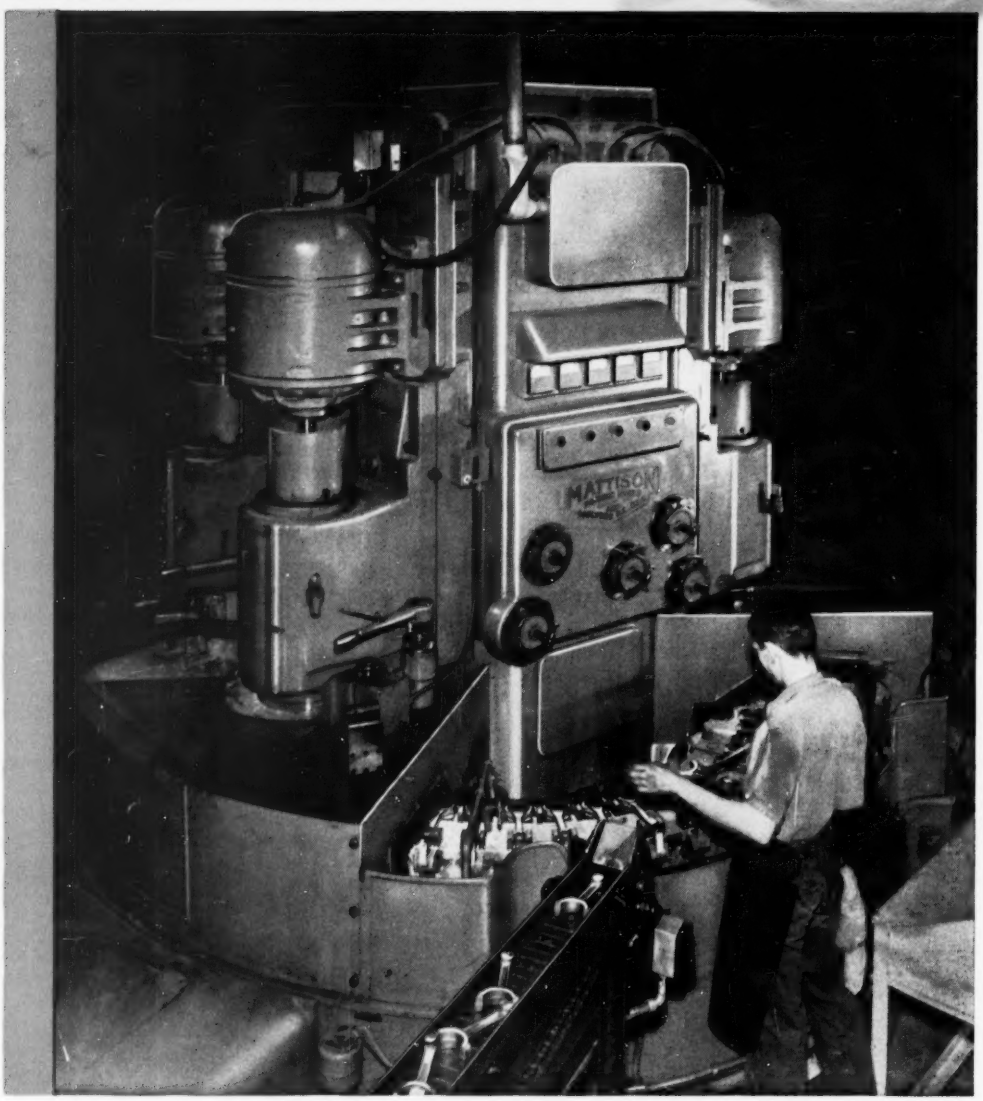
Barber-Colman Company

GENERAL OFFICES AND PLANT, 921 ROCK STREET, ROCKFORD, ILLINOIS

METAL CUTTING TOOLS SINCE 1908



MADE IN
CENTER OF MACHINE TOOL EXCELLENCE...ROCKFORD
ILLINOIS, U.S.A.



● At the Cleveland Engine Plant of the Ford Motor Company, both sides of wrist-pin and crank-pin bosses are accurately ground on a high production basis with this five wheel Mattison (Hanchett-Type) Vertical-Spindle Automatic Rotary Surface Grinder. Work pieces are held in automatic clamping fixtures. Automatic sizers are constantly in operation checking the work and keeping all pieces within specified tolerances without operator's attention.

This is only one of the many grinders made by Mattison. Whatever your surface grinding problems may be, write us for our recommendations on the proper method and machine for your job.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

MADE IN

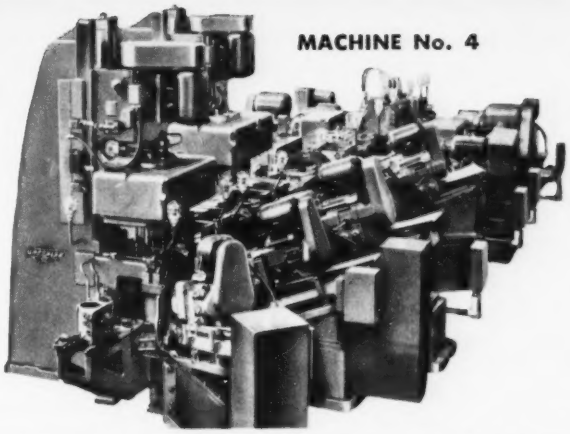
ROCKFORD...CITY OF MACHINE TOOL SPECIALISTS

ILLINOIS, U.S.A.



208 OPERATIONS IN 44.3 SECONDS

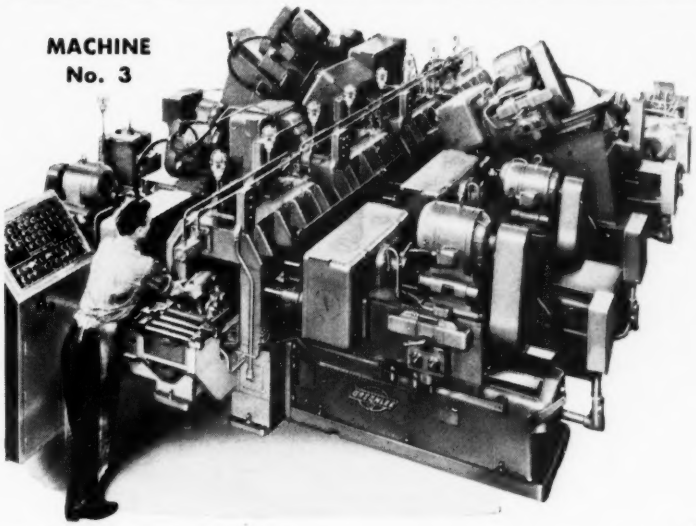
These recently-built Greenlee transfer machines mill, bore, drill, ream, and tap transmission cases for a well-known automobile. A total of 183 tools complete 208 operations in an automatic cycle time of 44.3 seconds. Features include face and end-milling heads, turnover and chip-cleanout stations, and indicator lights for tool changing. Self-contained hydraulic units conform to JIC standards for easy maintenance. These outstanding machines are among the newest built by Greenlee — a pioneer in progressive transfer-machine principles.



MACHINE No. 4

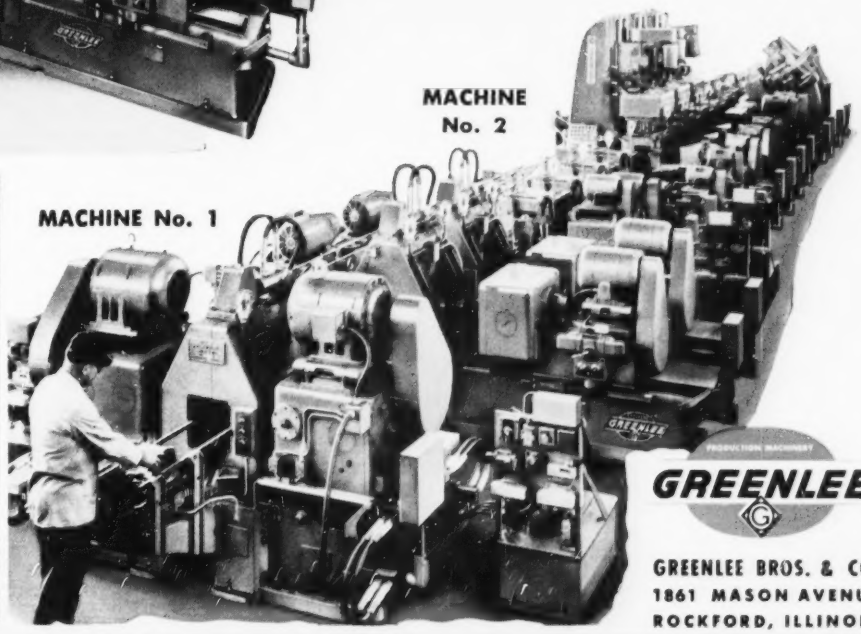
GREENLEE

MACHINE No. 3

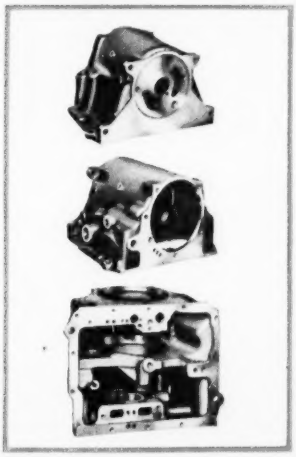


TRANSFER MACHINES
PROCESS
AUTOMATIC
TRANSMISSION CASES
AT THE PRODUCTION RATE OF
65 CASES PER HOUR

MACHINE No. 2



MACHINE No. 1



GREENLEE

GREENLEE BROS. & CO.
1861 MASON AVENUE
ROCKFORD, ILLINOIS

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES



MADE IN
YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...**ROCKFORD**
ILLINOIS, U.S.A.

Automatic Production

WITH BARNESDRIL MACHINES

gives you
more pieces per hour
more operations per cycle
and less cost per piece

Production Unit-Type Machines

Single or Multiple Spindle

Anti-Friction Spindle Bearings

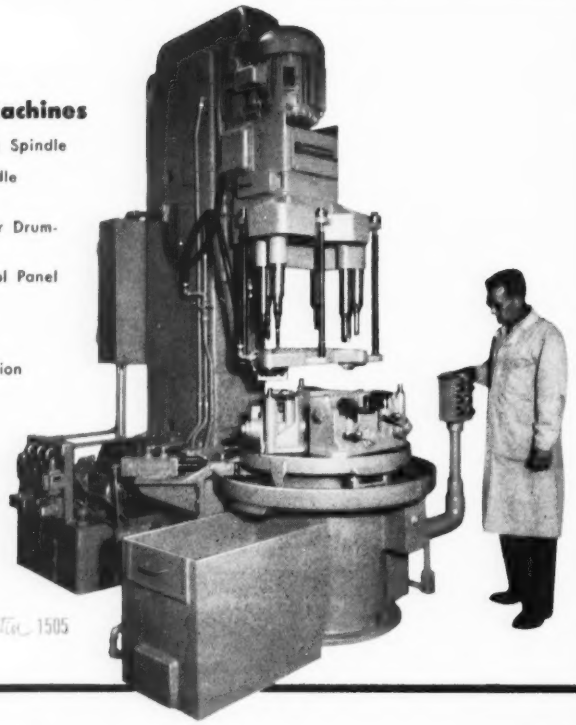
Power Indexing or Drum-Type Tables

Centralized Control Panel

Infinite Feeds

Selected Speeds

Automatic Lubrication



Write for bulletin 1505

These new BARNESDRIL High Production Units take full responsibility for precision hole machining and finishing at high rates of output and less cost per piece.

Engineered to suit your particular production problems, you can select your own operations and rate of output and BARNESDRIL Engineers design the machine and the cycle to produce these.

Automatic cycling and indexing, with precision control over each operation, assures constant duplication of parts at a prescribed rate of output. Operators simply load and unload at the completion of each machining cycle. As a result you produce more pieces per hour at less cost each.

Consult your BARNESDRIL Sales Engineer today, and ask him how these improvements can be applied to your production problems for greater efficiency and reduced cost.

High Production Transfer Machines

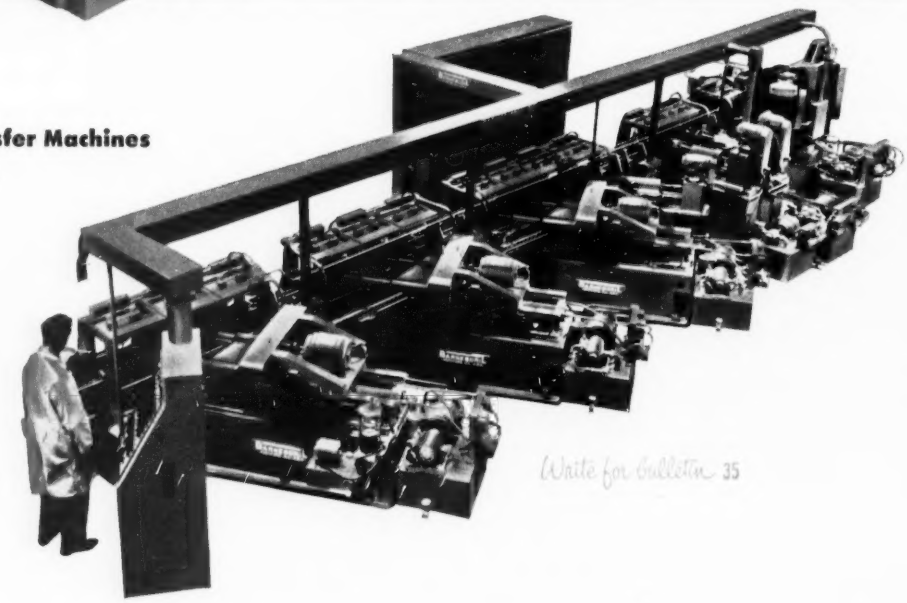
Combined Operations Sequence

Automatic Oiling System

Chip Conveyor System

Electronic Control System

Automatic Cycling



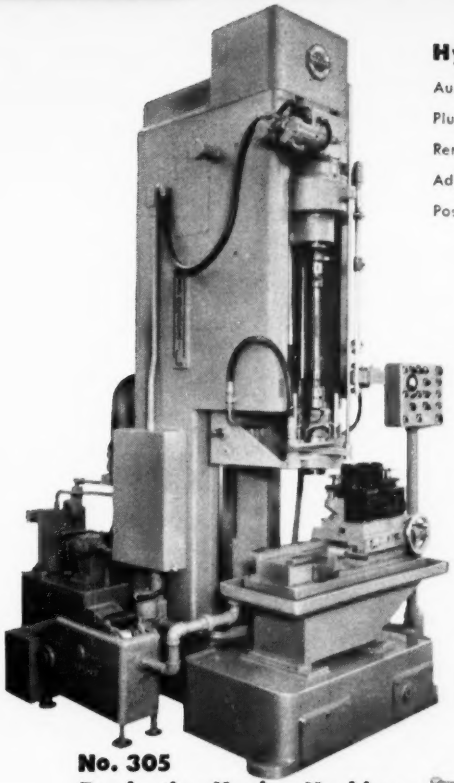
Write for bulletin 35

MADE IN

ROCKFORD...FOR MACHINES DESIGNED TO SUIT YOUR PRODUCTION

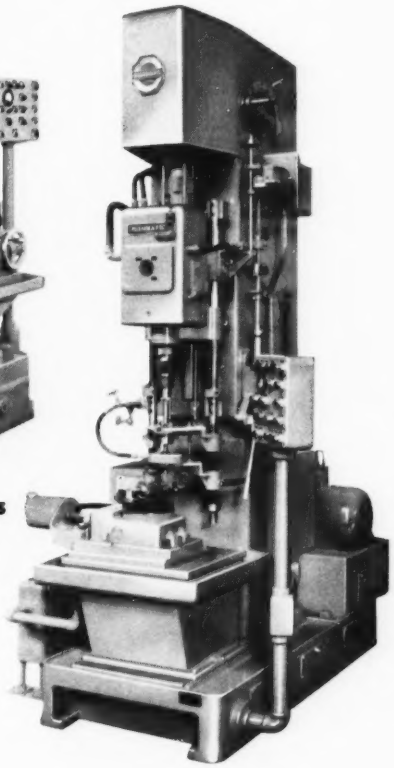
ILLINOIS, U.S.A.





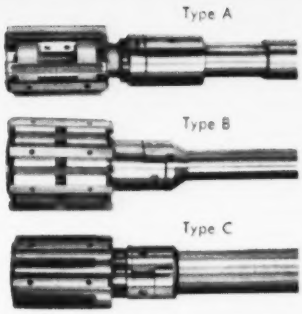
Hydraulic Honing Machines

Automatic Cycling
Plugmatic Sizing
Remote Control Hone Expansion
Adjustable Stroke Control
Positive Automatic Bore-To-Bore Sizing



No. 305
Production Honing Machines
No. 223

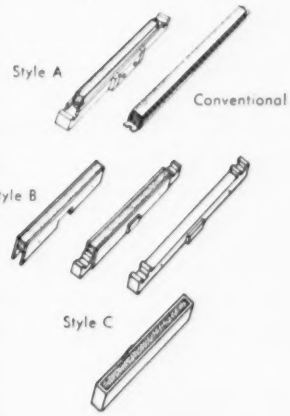
Write for bulletin 1215

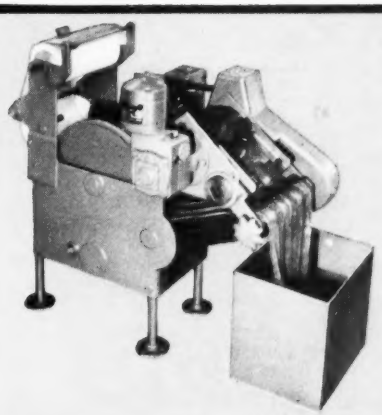


Honing Tools and Abrasives

Long Abrasive Stone Life
Stepped-Up Stock Removal
Quick-Mounting
Economical Replacement
Improved Cutting Edge Support
Electrical
Mechanical
Hydraulic Expansion

Write for bulletin 5005

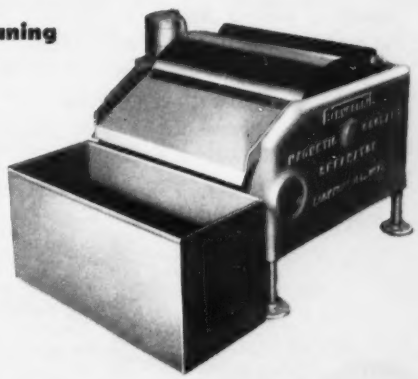




Automatic Coolant Cleaning

Efficient coolant cleaning sharply reduces machine maintenance and downtime, increases finish quality, and prolongs coolant life. New BARNESDRIL developments offer even greater improvements in coolant supply and chip disposal.

Write for bulletin 3001



HOLE BARNESDRIL FINISHING

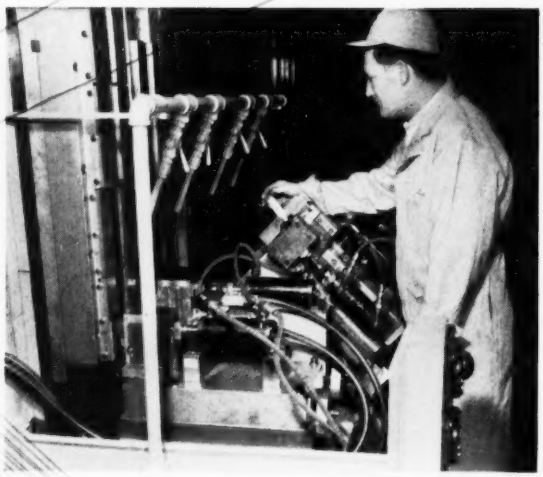
BARNES DRILL CO.

820 CHESTNUT STREET • ROCKFORD, ILLINOIS



MADE IN
FOR PRODUCTION MACHINE TOOLS IT'S...ROCKFORD
ILLINOIS, U.S.A.

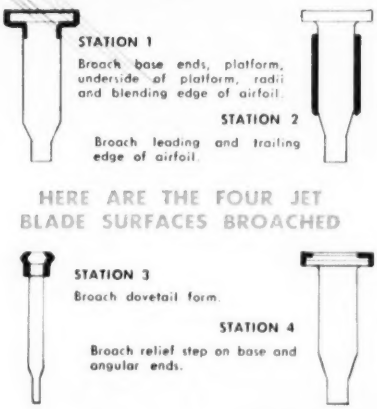
Broaching jet blades



American Dual Ram Surface Broaching Machine performs 4 operations on stainless steel blades

To broach stainless steel jet compressor blades, American installed standard vertical hydraulic dual-ram surface broaching machines with tilting work tables. Each machine was arranged with 4 broaching stations, two at each ram. One of each of the operations shown are performed at each of the 4 stations. The parts are automatically clamped and unclamped with the operator loading the stations at one ram while the other is broaching.

For answers to your broaching problems write to American — the company that makes all three — machines, fixtures and broaches.



HERE ARE THE FOUR JET BLADE SURFACES BROACHED



Catalog #300 illustrates and describes American surface broaching machines. Send for a copy for your files.

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

SUNDSTRAND

MADE IN ROCKFORD...MACHINE TOOL PLANTS CLOSE TO YOUR PLANT ILLINOIS, U.S.A.



TRULY...



AN AMAZING MACHINE!

EKSTROM, CARLSON

H-121 "POWER-ARM"

CONTOUR ROUTING *and* MILLING MACHINE

Powerful!
Fast-cutting!
Easy to Operate!

Do you want to banish, forever, tedious, *back-breaking* manual routing in the machining of your aircraft parts? Then, *here's* EKSTROM, CARLSON's solution! This machine, conceived by us, is specially designed to provide greater production at lower cost when template-routing and milling today's heavy aluminum plate or thick stacks of tough-cutting aluminum sheets. Hydraulically-operated, the entire operation is effected from a "Utopian" remote control pushbutton stand that starts the motors, lowers the head for template contact prior to the actual cutter descent, and controls the speed, rapid traverse, and direction of travel. The spiral-flute, collet-mounted router bit (also an ECCo product) is direct-driven by a high-cycle, 30 hp motor at 14,400 rpm. Even an inexperienced operator can quickly learn how to "pilot" the head around the most intricate template, and can then proceed to turn out an amazing quantity of work. For further details on this entirely new and revolutionary machine, write us *TODAY* . . . and learn all about it!

ECCO

DEPT. M-4
EKSTROM, CARLSON & CO.
1400 Railroad Ave.
Rockford, Ill.

FOR GREATER AIRCRAFT PRODUCTION!



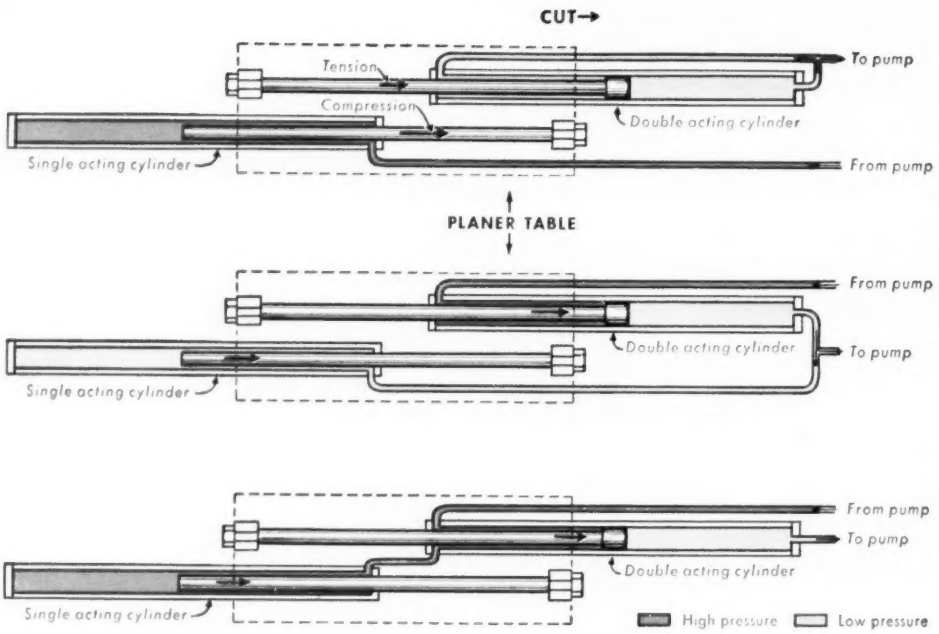
MADE IN
FOR METAL REMOVAL WITH ACCURACY AND SPEED...ROCKFORD
ILLINOIS, U.S.A.

the triple circuit

high speed
LOW CUTTING FORCE

medium speed
MEDIUM CUTTING FORCE

low speed
HEAVY CUTTING FORCE



Infinite Speeds from 10 to 300 fpm. stepped through 3 distinct cutting force ranges.

Pendant control of range and cutting speed selection.

Maximum return speed regardless of cutting speed.

Quick reversals with minimum overtravel.

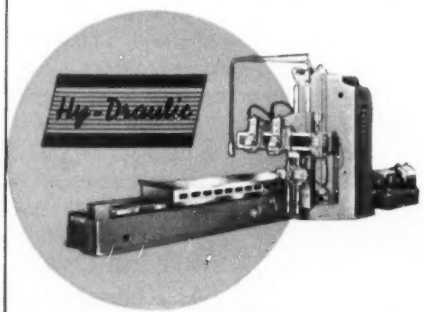
Suitable for prolonged use on short stroke work, as well as long work.

Hydraulic drive and feed has long provided efficiency and ease in the planing and shaping of metal.

Now a singular new dimension has been added to the proven efficiency and economy of Hydraulic planing. The new Triple Circuit provides the correct combination of cutting speed and required force, to most economically machine materials from the free cutting types to the toughest steel.

Many plants, large and small, who are evaluating their present equipment will find the Triple Circuit a significant development in their plans for plant modernization.

Get full details on this new Hy-Draulic achievement from any Rockfod Machine Tool Co. Representative, or write directly to us.



ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

MADE IN ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS
ILLINOIS, U.S.A.



eliminate the guesswork in selecting tool steels

Thousands of metal working people are using the Crucible Tool Steel Selector to determine exactly which type of steel they need. This handy selector covers 22 tool steels which fit 98% of all tool steel applications.

The selector is unique because it starts with the ultimate use of the steel. It breaks down all tool steel applications into six major classifications, under which the different grades of steel available for certain specific requirements are indicated in legible cutouts. Heat treatment and machinability data are also included for each grade.

A flip of the dial will give you the answer, and almost just as quickly you can get the steel you select. For each type of steel shown on the selector is in stock in Crucible warehouses, conveniently located throughout the country.

To get your Selector merely fill in the coupon and mail. There is no obligation whatsoever.



⅓ actual size, Selector is in 3 colors

HERE'S AN EXAMPLE:

Application – Deep drawing die for steel

Major Class – Metal Forming – Cold

Sub-Group – Special Purpose

Tool Characteristics – Wear Resistance

Tool Steel – Airdi 150

A turn of the dial does it! And you're sure you're right

Crucible Steel Company of America
Dept. M, Oliver Building
Pittsburgh, Pa.

Name _____

Company _____ Title _____

Address _____ City _____ State _____

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **TOOL STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA · TOOL STEEL SALES · SYRACUSE, N. Y.

CUMBERLAND GROUND BARS

We manufacture 8″ diameter, 7-1/2″, 7″, 6-1/2″, 6″, and also odd and intermediate sizes down to and including 1-1/8″.

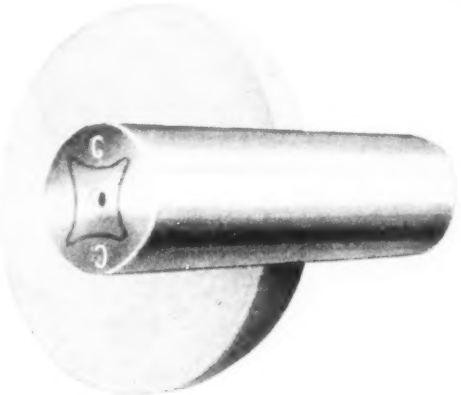


ON THE WEST VIRGINIA SHORE, OVERLOOKING THE POTOMAC RIVER, STANDS THE JAMES RUMSEY MONUMENT

The first practical steamboat in the world was run on the Potomac River a few miles below Cumberland, Maryland.

GEORGE WASHINGTON said in his diary, under date of September 6, 1784: "Remained at Bath all day and was shown the Model of a boat constructed by the ingenious Mr. Rumsey, for ascending rapid currents by mechanism; the principles of this were not only shown, and fully explained to me, but to my very great satisfaction, exhibited in practice in private under the injunction of secrecy—."

At a later date GEORGE WASHINGTON said in his diary: "Spent the afternoon with Mr. Rumsey and then Alexander Hamilton and I rode on to Cumberland, Maryland."



Symbol of Quality

Approximately 100 years after the exhibit of this steamboat, Cumberland began grinding bars. They found through experience this was the best method by which accurate steel bars could be produced. These bars are so carefully ground that they are adapted for mass production where gears, pulleys, sprockets and bearings must slide on the bars without delay due to filing or fitting.

IMMEDIATE BARS

DISTRIBUTED BY

Baltimore, Maryland—Atlantic Cliffix & Bit
Boston, Mass.—Hendridge Brothers Company
Bridgeport, Conn.—Hunter & Hazen, Inc.
Buffalo, N. Y.—Jos. T. Ryerson & Son, Inc.
Cambridge, Mass.—Brass Wire Company
Charlotte, No. Carolina—Edgcomb Steel Co.
Chicago, Ill.—Central Steel & Wire Co.
Cincinnati, Ohio—Jos. T. Ryerson & Son, Inc.
Cleveland, Ohio—The Brand Steel Company
Detroit, Michigan—Central Steel & Wire Co.
Fort Worth, Texas—C. A. Fischer
Hartford, Conn.—Hunter & Hazen, Inc.
Indianapolis, Ind.—Tanner & Company
Jersey City, N. J.—Jos. T. Ryerson & Son, Inc.
Lakeland, Fla.—Mine & Mill Supply Co.
Los Angeles, Calif.—Link-Belt Co., Pacific Div.
Louisville, Ky.—Neill-LaVielle Supply Co.
Martinsburg, W. Va.—W. H. Reardon & Son
Milwaukee, Wis.—Central Steel & Wire Co.
Montreal, Canada—Drummond, McCall & Co., Ltd.
New Orleans, La.—R. J. Tipton Co.
New York City, N. Y.—Bright Steel Corp.
Oakland, Calif.—Link-Belt Co., Pacific Div.
Philadelphia, Pa.—Franklin Road Company
Philadelphia, Pa.—Horace T. Potts Co.
Pittsburgh, Pa.—McKee-Moser, Inc.
Portland, Maine—W. E. Boyle & Company
Portland, Oregon—Link-Belt Co., Pacific Div.
Providence, R. I.—Congdon & Carpenter Co.
San Francisco, Calif.—Link-Belt Co., Pacific Div.
Seattle, Wash.—Link-Belt Co., Pacific Div.
Spokane, Wash.—Link-Belt Co., Pacific Div.
Toronto, Canada—Drummond, McCall & Co., Ltd.
Worcester, Mass.—Pratt & Inman

CUMBERLAND STEEL COMPANY

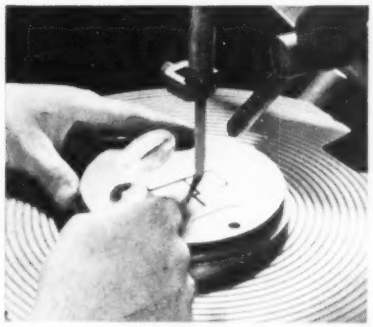
CUMBERLAND, MARYLAND, U. S. A.
ESTABLISHED 1845 INCORPORATED 1892

For more information on products advertised, use Inquiry Card, page 247

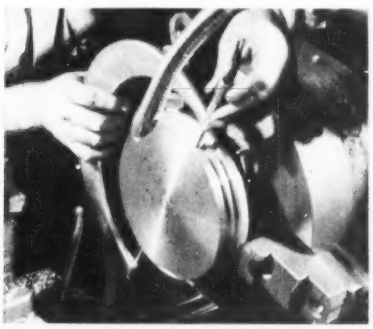
Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation



Finishing touches are applied to a die made of Cr-Mo-W (Chrome-Moly-Tungsten) at extrusion plant of Kaiser Aluminum & Chemical Corp.



Lathe operator calipers die blank, made of Cr-Mo-W. This long-wearing, air-hardening steel, easy to machine, has good shock resistance.

. . . . . .

BETHLEHEM TOOL STEEL ENGINEER SAYS:



To Reduce Tool Failures Always Remove the "Feather" Edge

After tools are ground, a rough "feather" may often be found along the working edges. If this feather is permitted to remain, the chances are good that the cutting edges will dull prematurely. Or the tool may even fail after brief service. For best results it is advisable to remove these surface irregularities immediately after grinding. This is especially true of cutting tools.

We know several shop men, each of whom makes it a point to carry a pocket stone, just for this use. When a feather is noticed, out comes the stone. This worthwhile precaution results in longer tool life, and greater shop economy.

Why they chose this Hot-Work Steel for Aluminum Extrusions

They wanted a hot-work steel with great resistance to wear, capable of withstanding severe shock and drastic changes in temperature, and with the ability to provide trouble-free service in long production runs. And it's for those reasons that the die specialists at the busy extrusion plant of Kaiser Aluminum & Chemical Corp., located at Halethorpe, Md., are well pleased with the performance of Cr-Mo-W (Chrome-Moly-Tungsten) for the manufacture of aluminum extrusions.

Bethlehem Cr-Mo-W, a general-purpose type of hot-work tool steel, has a 5 pct chromium content, plus moly and tungsten. It is especially suited for jobs that involve shock or radical temperature changes, and for all applications where heat checking is a problem.

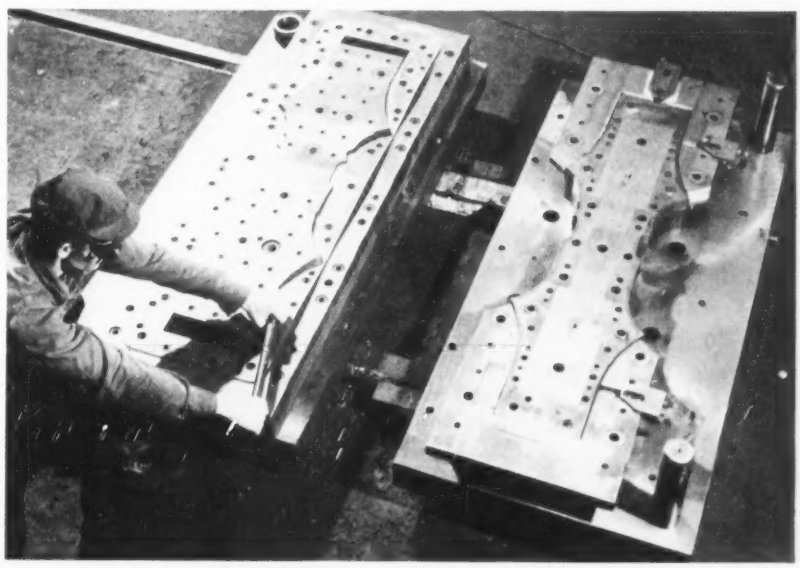
Cr-Mo-W hardens in air. It has good red-hardness, and fine resistance to distortion during heat treatment. It is an easy steel to machine because it can be annealed to 217 Brinell.

TYPICAL ANALYSIS

Carbon . . . 0.55 Tungsten . . 1.55
Silicon . . . 1.05 Molybdenum 1.65
Chromium . . . 5.00

Cr-Mo-W withstands severe impact on such highly-stressed parts as trimmer dies, die-casting dies, bolt gripper dies, hot-shear blades, and various types of punches.

If you have a job calling for a hot-work steel able to take shock and wide changes in temperature, and hold its dimensions through long production runs, give Cr-Mo-W a tryout. You can get full information, and quick delivery, from the nearest Bethlehem tool steel distributor.



DIE TO BLANK DIFFERENTIAL HOUSINGS

This large die, made of A-H5, is used in the cold blanking of sheet steel for the manufacture of truck and automobile differential housings. A-H5, another Bethlehem 5 pct chrome air hardening grade, with 1.00 pct carbon, is used for this application because of its wear resistance, and easy machinability.

NEW CARBOLOY

CEMENTED CARBIDE

Increases production up to 30% on heavy-duty steel-cutting jobs

New Grade 370 Carboloy cemented carbide cuts more cubic inches of steel per minute — with longer tool life — than any existing carbide. The first of the new Series 300 cemented carbides, Grade 370 was specially developed for taking heavier cuts in steel at higher speeds than ever before practical.

BUILT-IN TIP RIGIDITY

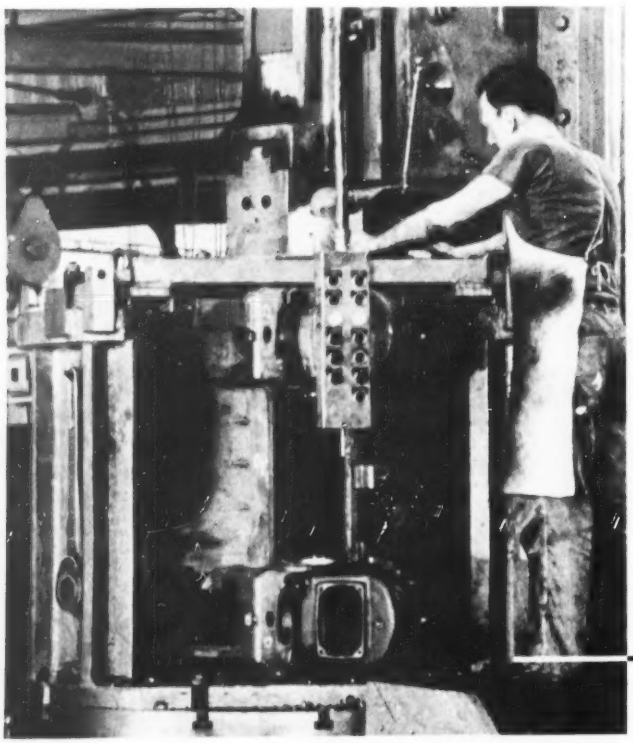
Heavy-duty, high-speed machining builds up great pressures and high temperatures which cause other tools to fail because their cutting edges deform. Grade 370 is made from start to finish by a new, carefully controlled manufacturing process which gives it a built-in structural rigidity to resist this deformation — even at temperatures of around 1800° F.

PROVED PERFORMANCE

Grade 370 has already been proved, both in Carboloy laboratories, and on tough on-the-job customer applications such as rolls, gun barrels, locomotive wheels and other heavy-duty operations. It successfully withstands higher temperatures and pressures of heavy cuts at higher speeds, and lasts longer — longer than any existing carbide. *Production goes up as much as 30%.*

AVAILABLE NOW

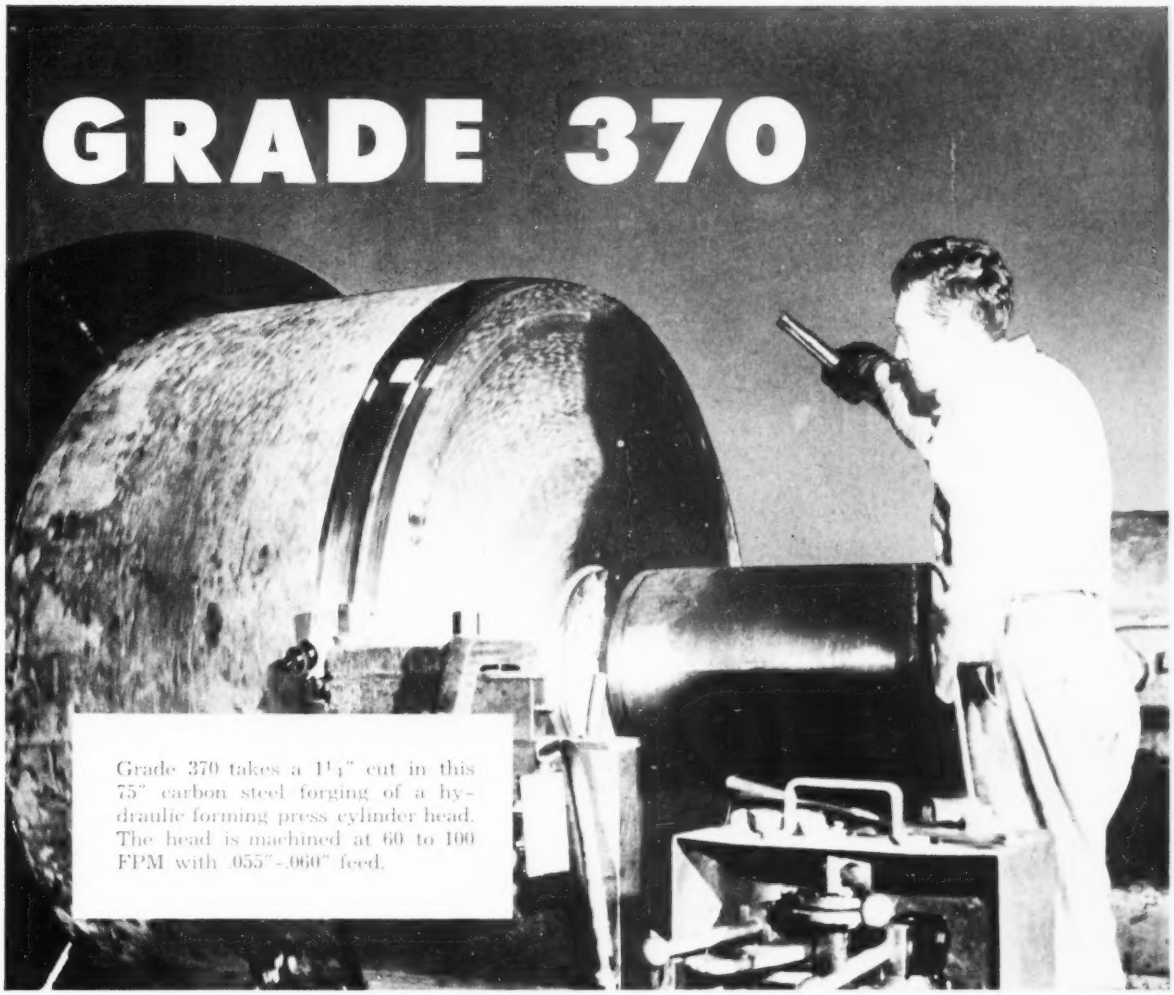
Grade 370 is available immediately in a number of sizes and shapes. Send coupon today for additional information and for free technical literature. The Carboloy Engineering Appraisal Service will work with you on specific applications.



Close-up of cylinder head forging. Grade 370 cuts large chips and withstands the tremendous pressure and temperature without deforming. With Grade 370, both machine downtime and tool cost per cubic inch of steel removed were substantially reduced.

Vertical mill taking $\frac{1}{4}$" to $\frac{3}{4}$" cut in an alloy steel casting for a traction motor frame. Grade 370 machined 70 FPM with .060" feed . . . and resulted in a reduction of tool costs of approximately 10 to 1 over other carbides.

GRADE 370



Grade 370 takes a $1\frac{1}{4}$" cut in this 75" carbon steel forging of a hydraulic forming press cylinder head. The head is machined at 60 to 100 FPM with .055"-.060" feed.



CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

Carboloy is the trademark for the products of the Carboloy Department of General Electric Company

CARBOLOY
Department of General Electric Company
11147 E. 8 Mile Blvd., Detroit 32, Michigan

Gentlemen: Rush me, at no cost or obligation, all facts now available on your new Grade 370 Carboloy cemented carbide.

Name

Company

Position

Address

City Zone State



LINDE'S News of Metalworking

New Machine Carriage Saves Time On Many Jobs

A new machine carriage in the low-priced field does dozens of metalworking jobs and does them more quickly, accurately, and uniformly than the most skilled hands. This machine, the OXWELD CM-45, handles practically all machine carriage requirements in small metalworking shops, and supplements heavier equipment in larger plants, shipyards, and mills.

Used on track, the CM-45 is ideal for accurate straight-line cutting. It also cuts top or bottom bevels at practically any angle. With standard radius rods, it cuts circles with diameters of from 2 to 54 inches. To cut larger circles, a longer radius rod can easily be substituted.

Flame-treating work be it flame-hardening, flame-softening, or low-temperature stress relieving requires precisely controlled heat. With the CM-45 and appropriate heating apparatus you get just that; thus you can be sure that each of your flame-treating jobs will be done uniformly.

These are only a few of the jobs that the OXWELD CM-45 Machine Carriage will do for you. Many additional cutting, welding, and heating applications will be suggested by the requirements of your own shop.

The CM-45 saves you time, not only because it does each job efficiently, but also because it is so easy to set up and operate. There is no complicated machinery to master. Its simple design makes it easy to adjust or repair. All parts are readily accessible.

Operating controls consist of a speed-control dial that can be preset or adjusted at any time, and a two-position clutch lever. All controls are grouped together at the rear of the machine for your convenience.

Since the machine weighs only 33½ lb. complete with cutting blowpipe as shown in Fig. 1, it's an easy, one-man job to move it from one section of your shop to another. The machine's compactness also makes it convenient for use in close quarters where larger machines cannot be used.

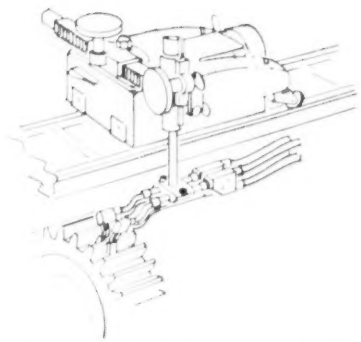


Fig. 2. Flame-treating work requires precise control of applied heat. The CM-45, with suitable apparatus, assures you of efficiency and uniformity on every job.

ANY LINDE representative will gladly show you how the OXWELD CM-45 Machine Carriage will help you turn out more work in less time. Call the nearest LINDE office today for a free demonstration.

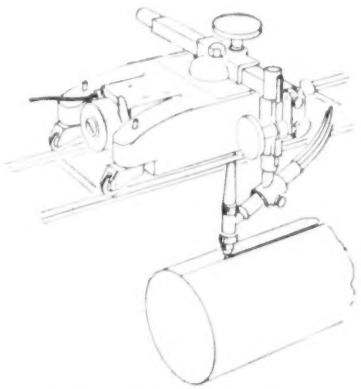


Fig. 3. Do special welding jobs, such as tube fabrication, quickly with the CM-45. Repeats are reduced to a minimum.

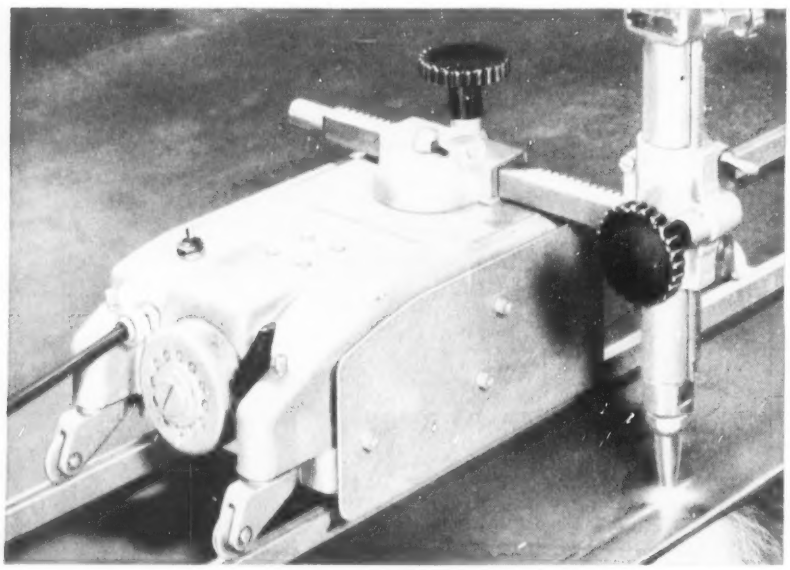
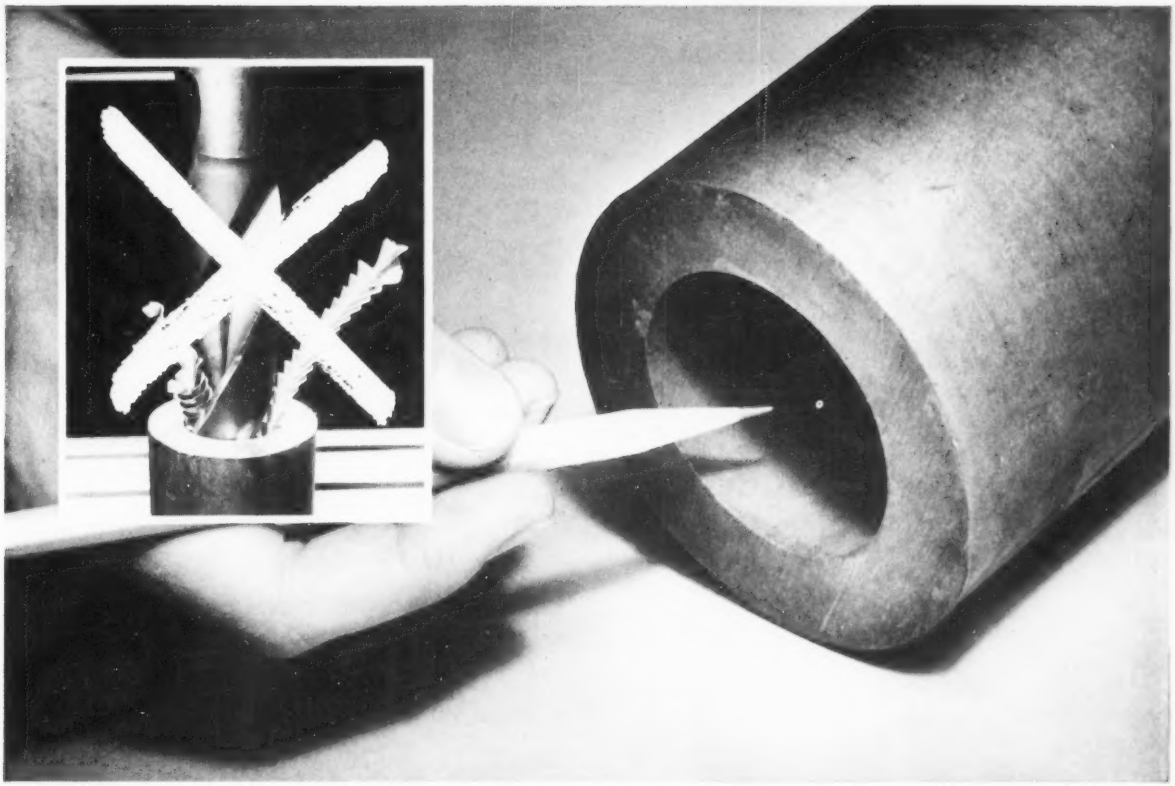


Fig. 1. Cut straight lines or bevels in plate or other steel forms. For all the CM-45's many jobs, a stepless speed range of 4 to 32 in. per min. is available.

The terms "Linde" and "Oxweld" are registered trade marks of Union Carbide and Carbon Corporation.

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: Dominion Oxygen Company, Limited, Toronto

For more information on products advertised, use Inquiry Card, page 247



Eliminate drilling! Finish boring's the first step with TIMKEN® seamless steel tubing!

DRILLING'S a thing of the past when you use Timken® seamless steel tubing. The hole's already there! You save time and money by starting with finish boring.

Screw machine stations are available for other jobs. The result: You add machine capacity without adding machines.

Timken seamless steel tubing saves you additional money because you don't waste steel. All you pay for is the steel you use. We give you the holes.

To make sure you get the most steel per dollar, our engineers will be glad to study your problem and recommend the most economical tube size for your hollow parts jobs.

Timken seamless steel tubing gives you high internal quality because the piercing process by which it's made is basically a forging process. It has a uniform spiral grain flow for greater strength, and a refined grain structure which brings out the best in the quality of the metal. And our rigid quality control makes sure that the quality is uniform from tube to tube and heat to heat. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



TIMKEN
TRADE-MARK REG. U.S. PAT. OFF.
Fine Alloy
STEEL

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

Are your Alloy Steel Bars in the PROFIT AREA for your MACHINE TOOLS?



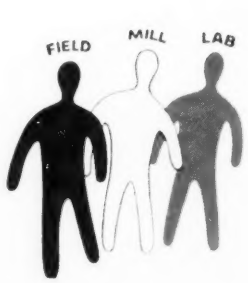
It's the outer rim of a Republic carbon-corrected alloy steel bar that helps you make a profit. In the ordinary heat-treated bar this is a "decarb" area that usually must be removed before parts can be made from stock. In a Republic bar, the carbon has been restored after heat treating . . . right out to the edge.

You don't machine away good metal into chips and shavings. And that can make a substantial difference in your profits.

Republic's 3-Dimension metallurgical service will be glad to show you how you can get in on such savings as these. It works with your metallurgists and production people to adapt cold-drawn carbon-corrected alloy steel bars to your product. The combined extensive experience and abilities of Republic Mill, Field and Laboratory metallurgists are added to the knowledge and skills of your engineers.

The result often means better products at reduced costs. Get in touch with your Republic Steel salesman. He can arrange for a Republic metallurgist to call at your convenience.

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.



3-Dimension Metallurgical Service
combines the extensive experience and co-ordinated abilities of Republic's *Field*, *Mill* and *Laboratory* Metallurgists with the knowledge and skills of your own engineers. It has helped guide users of Alloy Steels in countless industries to the correct steel and its most efficient usage. IT CAN DO THE SAME FOR YOU.

Republic ALLOY STEELS

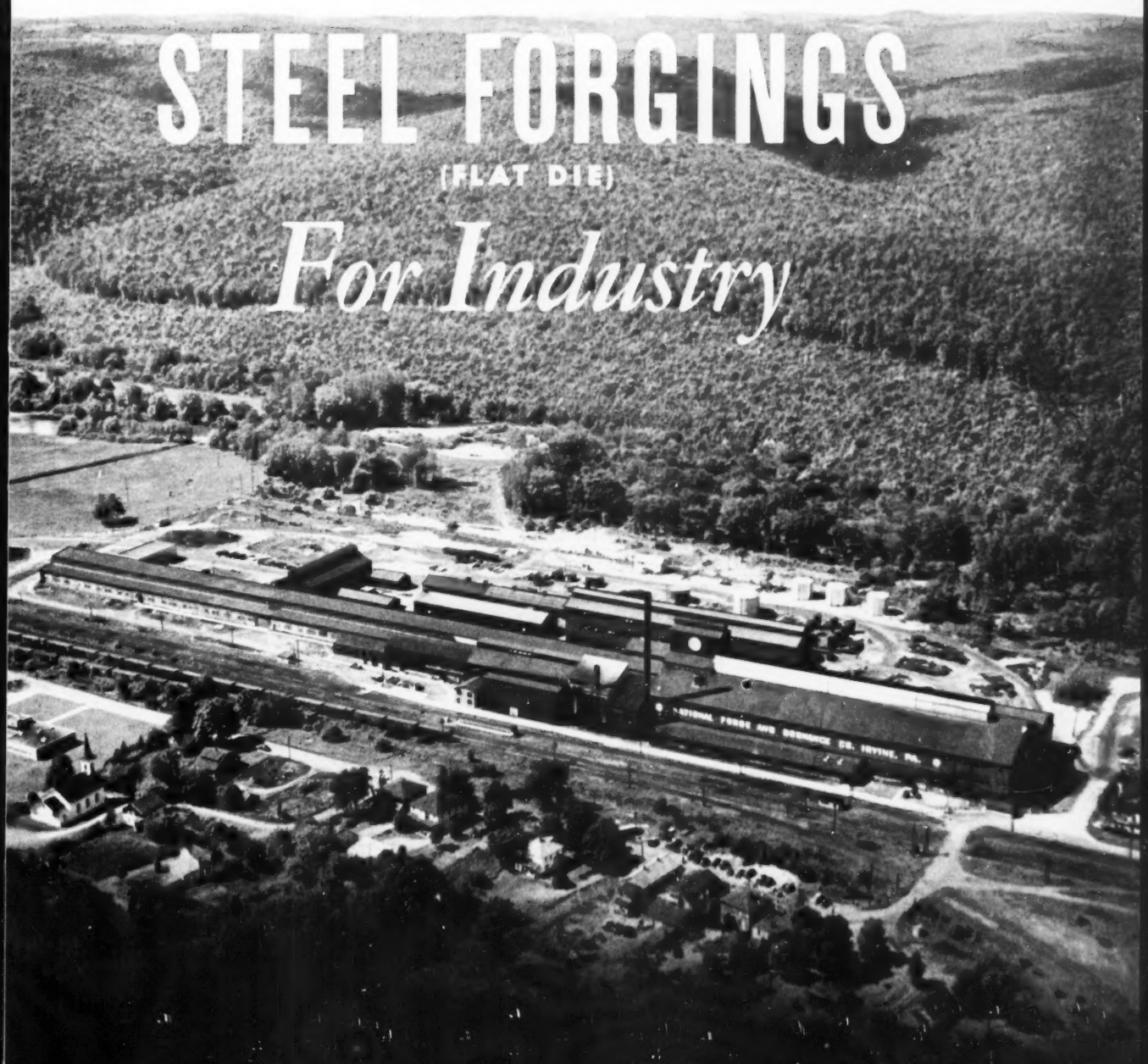
For more information on products advertised, use Inquiry Card, page 247

Steel Makers • Forgesmiths • Heat Treaters • Machinists • Testing Equipment & Machinery Manufacturers

STEEL FORGINGS

(FLAT DIE)

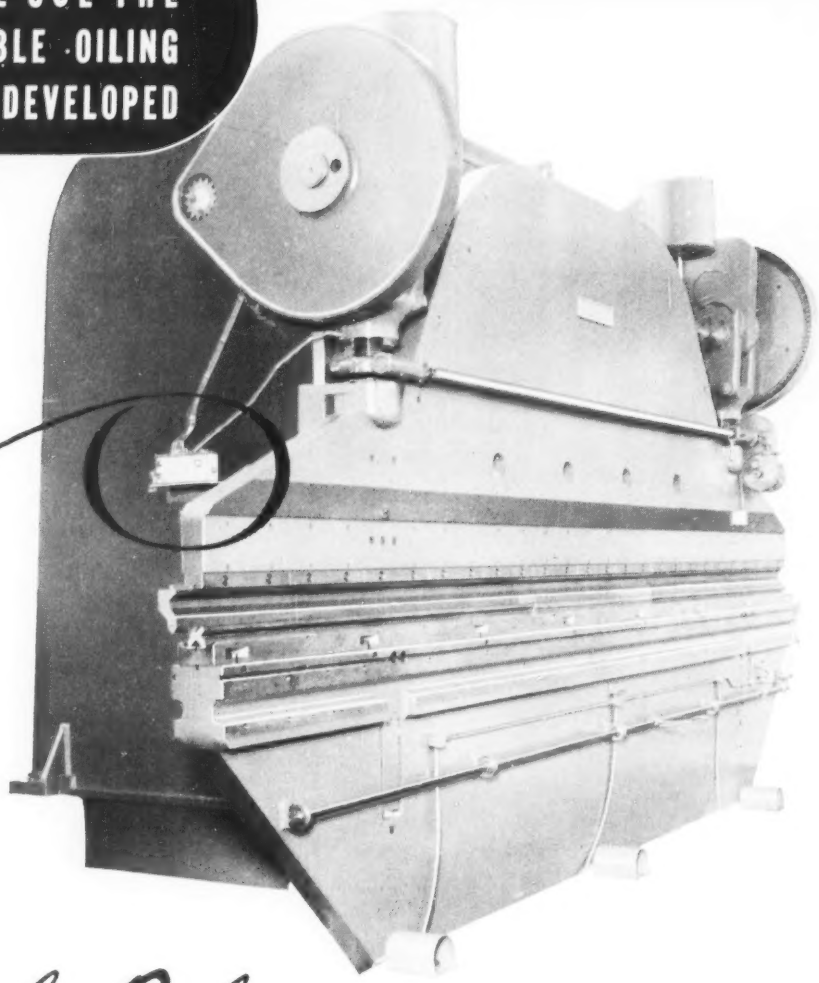
For Industry



NATIONAL FORGE AND ORDNANCE COMPANY

IRVINE, WARREN COUNTY, PENNSYLVANIA

MACHINES OF GREAT PERFORMANCE USE THE MOST DEPENDABLE OILING SYSTEM EVER DEVELOPED



Illustrated is Madison-Kipp Lubricator Model FD installed as original equipment on a ⅝" by 20' Cincinnati Press Brake, manufactured by the Cincinnati Shaper Co., Cincinnati, Ohio.

MADISON-KIPP

fresh Oil . . . by the measured drop, from a Madison-Kipp Lubricator is the most dependable method of lubrication ever developed. It is applied as original equipment on America's finest machine tools, work engines and compressors. You will definitely increase your production potential for years to come by specifying Madison-Kipp on all new machines you buy where oil under pressure fed drop by drop can be installed.

MADISON-KIPP CORPORATION

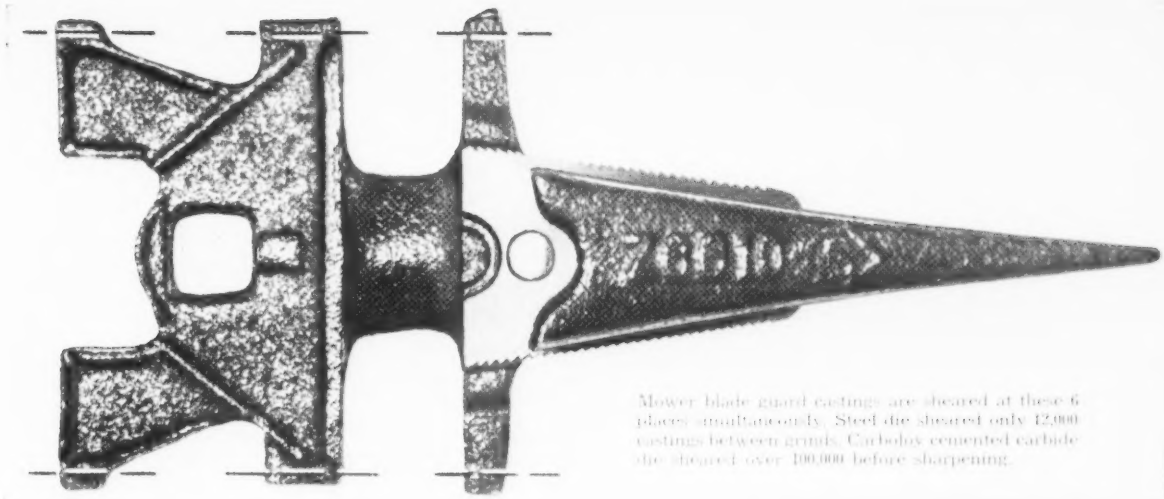
203 Waubesa Street, Madison 10, Wis., U.S.A.

ANCIENS ATELIERS GASQUY, 31 Rue du Marais, Brussels, Belgium, sole agents for Belgium, Holland, France and Switzerland.

WM. COULTHARD & CO. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia and New Zealand.

- *Skilled in* DIE CASTING *Mechanics*
- *Experienced in* LUBRICATION *Engineering*
- *Originators of Really High Speed* AIR TOOLS

For more information on products advertised, use Inquiry Card, page 247



Mower blade guard castings are sheared at these 6 places simultaneously. Steel die sheared only 12,000 castings between grinds. Carboloy cemented carbide die sheared over 100,000 before sharpening.

OLIVER CORPORATION REPORTS—

Carbide inserts increase die life over 800%!

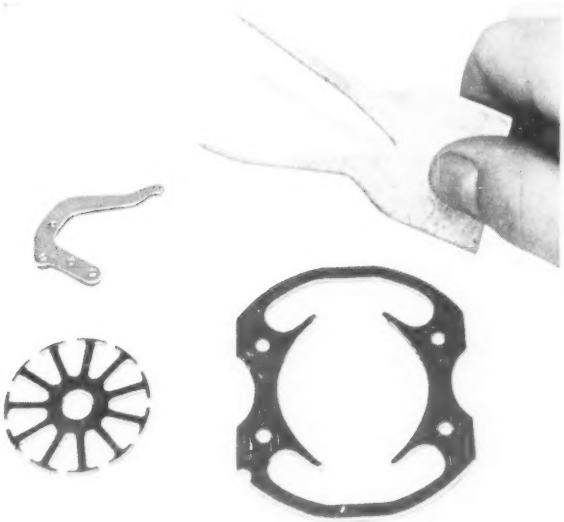
Carboloy cemented carbide on cutting edges of trim block shearing die increased production from 12,000 to well over 100,000 pieces between grinds!

When the Oliver Corporation switched from a steel die to a die equipped with Carboloy cemented carbide, things happened!

Carbide's stays-sharp-longer feature increased trim block life from one day to more than 8 days between grinds. It increased production, lowered maintenance costs, cut rejects, slashed downtime. There was no chipping or cracking of carbide under continuous impact; little grinding was needed to restore cutting edge.

Perhaps you have a die job — simple or complex, large or small — where you can get the same benefits. If so, have a Carboloy representative stop at your plant, show you how easily Carboloy cemented carbides can be profitably applied to almost any blanking, forming, drawing or piercing die.

Send coupon for free Carboloy Die Engineering Manual D-124 containing details on carbide applications.



Typical parts being produced by industry on carbide dies. Dies of Carboloy cemented carbide outlast steel dies 10 to 50 times. Produce burr-free, close tolerance parts with a minimum of maintenance and downtime.

Carboloy is the registered trademark for the products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

MAIL TODAY

CARBOLOY Department of General Electric Company
11147 E. 8 Mile Blvd., Detroit 32, Michigan

Gentlemen:
Send me, free, your helpful Die Engineering Manual D-124.
Have a Carboloy representative call at my plant.

Name _____ Position _____

Company _____

Address _____

City _____ Zone _____ State _____

Why accept this?... when you actually want this?...





CARMET blanks are preformed to your order!

GET THE NEW

CARMET CATALOG

Just out . . . 32 well-illustrated pages, containing data on all Carmet grades, and on Carmet blanks, tools, die sections, punches, draw die inserts, etc.; also special preforming to order. ● *Write for your copy.*

ADDRESS DEPT. M-49

Above are shown two carbide metal rolls of identical composition. The one at the left cost the user about nine times as much as the one at the right. That differential was due solely to grinding vs. non-grinding. The plain face needed serrating, whereas the ready-toothed face needed nothing.

In many uses where tolerances are not too critical, CARMET blanks *preformed* to your specifications are ready for service without additional costly grinding. On jobs where finish grinding is necessary, the quality of Carmet's preforming holds grinding stock to a minimum.

Hundreds of special shapes can be preformed in Carmet. For practical suggestions that fit your needs, call or write your nearest A-L representative. ● *Allegheny Ludlum Steel Corporation, Carmet Division, Wanda & Jarvis Avenues, Detroit 20, Michigan.*

For complete **MODERN** Tooling, call

Allegheny Ludlum

W&D 4048

AL FINE TOOL STEELS SINCE 1854

For more information on products advertised, use Inquiry Card, page 247

WHICH OF YOUR METAL-CLEANING JOBS WOULD YOU LIKE TO IMPROVE?



¶ Are you cleaning metal in the most economical way? *See page 9 of Oakite's* FREE *booklet on Metal Cleaning.*

¶ Are you cleaning metal the fastest way? *See page 11.*

¶ Can you clean brass anodically with no tarnish? *See page 18.*

¶ Can you clean steel and prepare it for painting for less than 20 cents per 1,000 square feet? *See page 24.*

¶ Do you need a cleaner that removes rust and oil at the same time; often eliminating all need for pickling? *See page 28.*

¶ How do you clean parts that are too large to be soaked in tanks or sprayed in machines? *See page 30.*

¶ Does your burnishing barrel produce high luster? *See page 32.*

¶ What do you do when oversprayed paint neither floats nor sinks in your paint spray booth wash water? *See page 35.*

¶ Would you like to eliminate expensive drying from your anti-rust procedure? *See page 37.*

LISTED BELOW are some of the operations discussed in this 44-page illustrated booklet. Please check the jobs in which you are interested. Then let us show you how Oakite methods can give you better production with greater economy.

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS · METHODS · SERVICE

OAKITE PRODUCTS, INC., 26 Rector Street, New York 6, N. Y.

Tell me about Oakite methods and materials for the following jobs:

- ☐ Tank cleaning
- ☐ Machine cleaning
- ☐ Electrocleaning steel
- ☐ Electrocleaning non-ferrous metals
- ☐ Pickling, deoxidizing, bright dipping
- ☐ Pre-paint treatment
- ☐ Zinc phosphate coating
- ☐ Paint stripping
- ☐ Steam-detergent cleaning
- ☐ Barrel cleaning
- ☐ Burnishing
- ☐ Rust prevention
- ☐ Treating water in paint spray booths
- ☐ Machining and grinding

☐ ALSO send me a FREE copy of your booklet "*Some good things to know about Metal Cleaning*"

Name _____

Company _____

Address _____

Technical Service Representatives in Principal Cities of U. S. and Canada

2 Stainless Parts . . . *look alike*



but with 1 of them

The job becomes profitable

This main shaft for a fishing reel was anything but sport for the manufacturer. The steel used had to have excellent corrosion resistance, concentricity, close and uniform tolerances as supplied, and good machinability. With ordinary Type 416 Stainless, the Company just couldn't produce the shafts at a profit. But when the manufacturer made just *one* change . . . to Carpenter Stainless No. 5 (Type 416) . . . the profit picture changed completely.

Tool breakage is eliminated

Another problem when the ordinary Type 416 Stainless was used, was a serious rate of tool breakage. And here again, just one change . . . to Carpenter No. 5 . . . eliminated this headache.

All requirements are met

With Carpenter No. 5, the manufacturer now reports that *all* requirements are met and the shafts are coming off the line at a good rate. Here's just one more example of the difference Carpenter builds into stainless steels. Specify *Carpenter* on your next stainless order and see the profitable difference all along the line from initial operation to finished part.

Make the one change that counts . . .

change to *Carpenter*

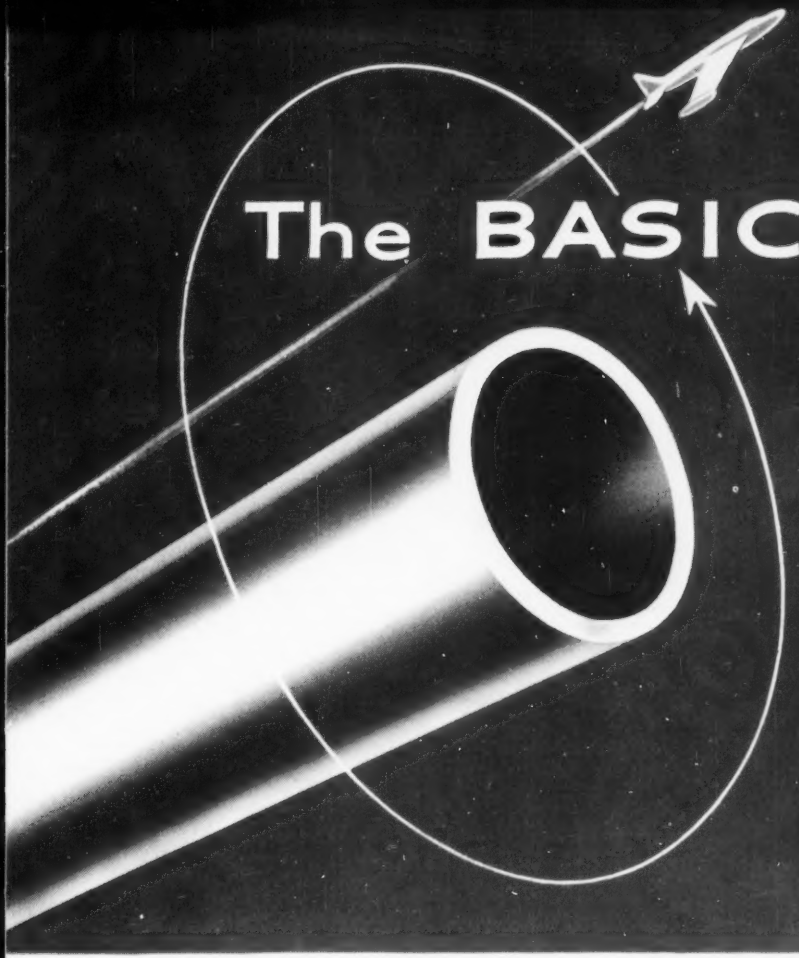
Free-Machining Stainless

take the problems out of production

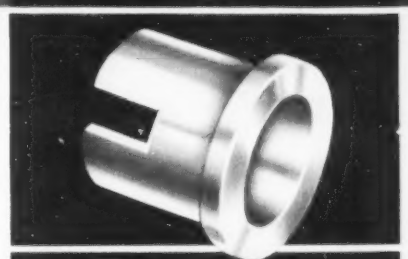
THE CARPENTER STEEL COMPANY, 105 W. Bern St., Reading, Pa.
Export Department: The Carpenter Steel Co., Port Washington, N.Y.—"CARSTEELCO"

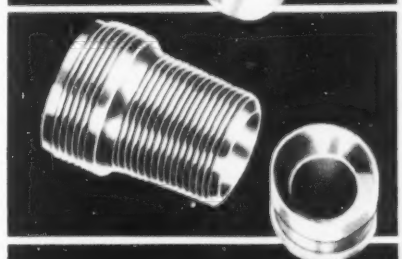
For fast delivery, call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor

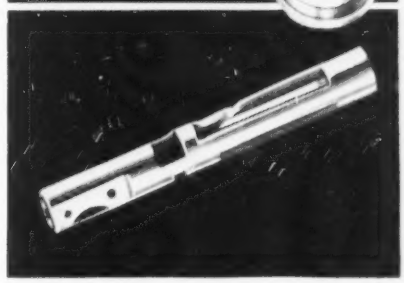
The BASIC SHAPE of things to come!











When you use Shelby Seamless Mechanical Tubing for hollow cylindrical parts, the basic shape—the tube—is already made.

You pick up the job where Shelby leaves off, and you find that it requires much less cutting or boring than solid bar stock or forgings would.

You fashion the most complex of parts, yet you produce them faster and at lower cost than identical parts machined from solid bar stock.

You turn out a far better precision product, yet fewer operations are involved, man and machine hours are reduced, rejects are fewer, and over-all parts production is speeded up.

In some instances, the use of Shelby Seamless Tubing has increased production to such a degree that savings of 70 percent have resulted.

Shelby offers you the high strength, the uniformity, the dependability that only *seamless* tubing can give. And it's available in a complete range of diameters, wall thicknesses, and analyses to meet the most exacting requirements. If you're interested in cutting production costs—and who isn't?—while turning out a superior product, send for our free Bulletin Number 17. And feel perfectly free to call on our engineers if you need help in applying Shelby Seamless Steel Mechanical Tubing to your product.

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S SHELBY SEAMLESS MECHANICAL TUBING

UNITED STATES STEEL

MILES APART IN SIZE AND WEIGHT





Here are two Bethlehem drop forgings that happened to be going through the shops the same day. The small connecting rod weighed only a pound and a half. The big one, a pretty husky specimen, couldn't be cradled in anybody's hands. It weighed more than a hundred times as much as the little fellow.

This contrast isn't unusual, for Bethlehem makes drop forgings ranging in weight from a few ounces up to 250 lb. Through the years we've produced literally millions of them—gear blanks, connecting rods, hooks, wrenches, links, rings, crankshafts, tool parts—and so many other designs it's hard to estimate the number. These forgings have gone into scores of industrial fields, including petroleum, mining, aviation, power, and transportation.

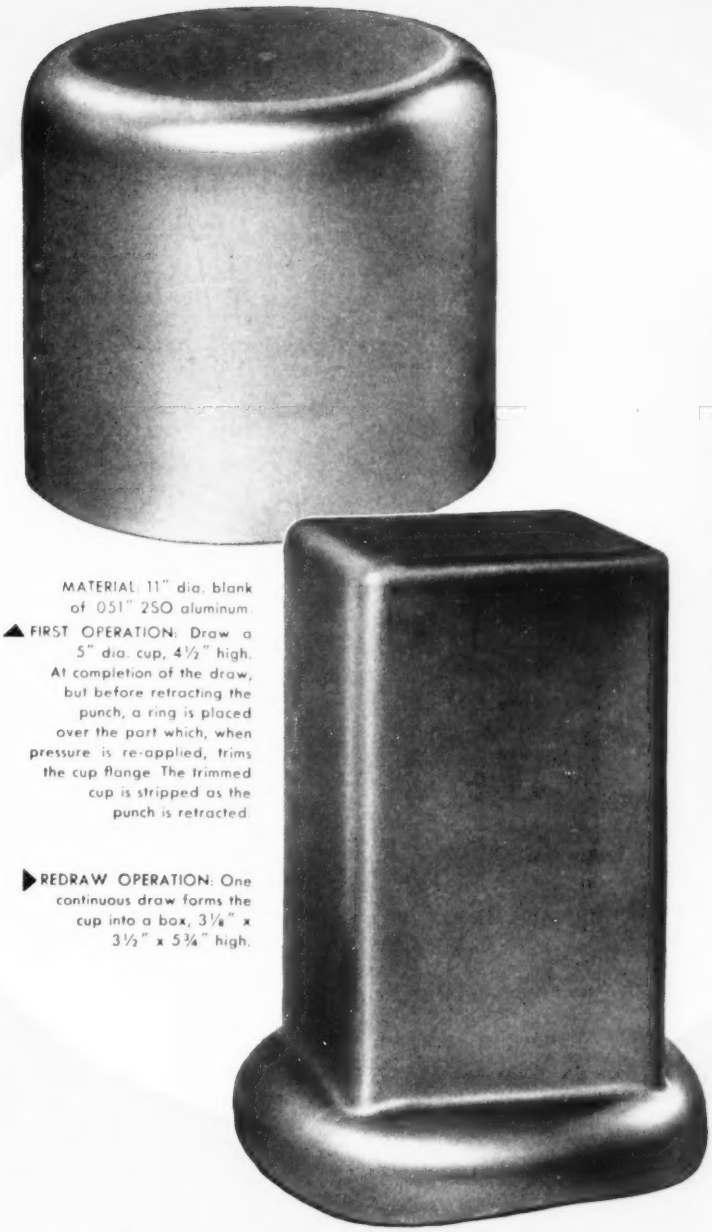
Today we're better fixed than ever to fill your needs in closed-die forgings. Ours is a fully-integrated operation—everything from making the steel to cleaning and shipping the finished forgings. Call us the next time you're in the market! We'll welcome the chance to work with you and your staff.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor*—Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM DROP FORGINGS



MATERIAL: 11" dia. blank of .051" 2SO aluminum.

▲ FIRST OPERATION: Draw a 5" dia. cup, 4½" high. At completion of the draw, but before retracting the punch, a ring is placed over the part which, when pressure is re-applied, trims the cup flange. The trimmed cup is stripped as the punch is retracted.

▶ REDRAW OPERATION: One continuous draw forms the cup into a box, 3⅛" x 3½" x 5¾" high.

redrawing a round into a square by Hydroforming

Here's a dramatic, new *switch* to the "can't fit a square peg into a round hole" story . . . the Cincinnati 12" Hydroform version: Draw a round cup, then redraw it, producing a deep, rectangular box!

Try this on your draw press in *two forming operations* . . . then compare your conventional tools—their cost and complexity—with these: A punch and a draw ring to produce the cup . . . a ring to trim the cup flange . . . a redraw sleeve with square opening, which is placed into the first operation draw ring to accommodate the predrawn cup . . . and a finish punch to form the box. Of these five, simple Hydroform tool elements, only the finish punch and the internal opening of the redraw sleeve could not be machined on a lathe.

This is another example of the *unique* drawing action—the *simplicity* and *economy* of tooling—the *savings* of operations—made possible by Hydroforming. Can your company use these Hydroforming advantages? Find out now, by calling in a Cincinnati Milling field engineer. For a description of the Hydroforming process and specifications of the 12", 19", 23", 26" and 32" machine sizes, write for Bulletin M-1759-2.

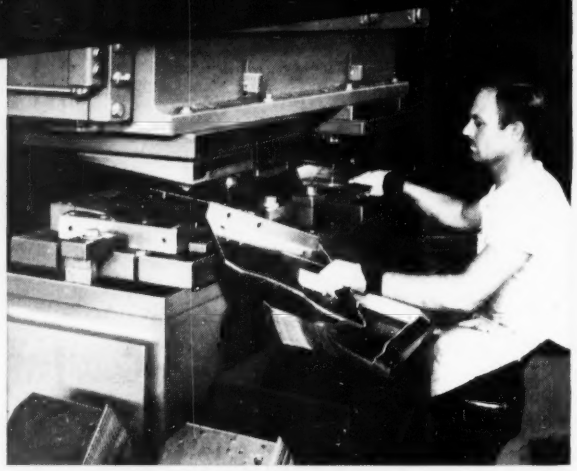
CINCINNATI **Hydroform**

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.

NIAGARA

SERIES B
GAP FRAME Double Crank Presses

Niagara B-4 x 72 Press at the General Machine Works in Los Angeles. It is shown here fitted with two dies for forming operations on an automatic deflector.



The same press as shown above arranged with dies for redrawing projectile parts in 5 steps. Shells are transferred manually from die to die.



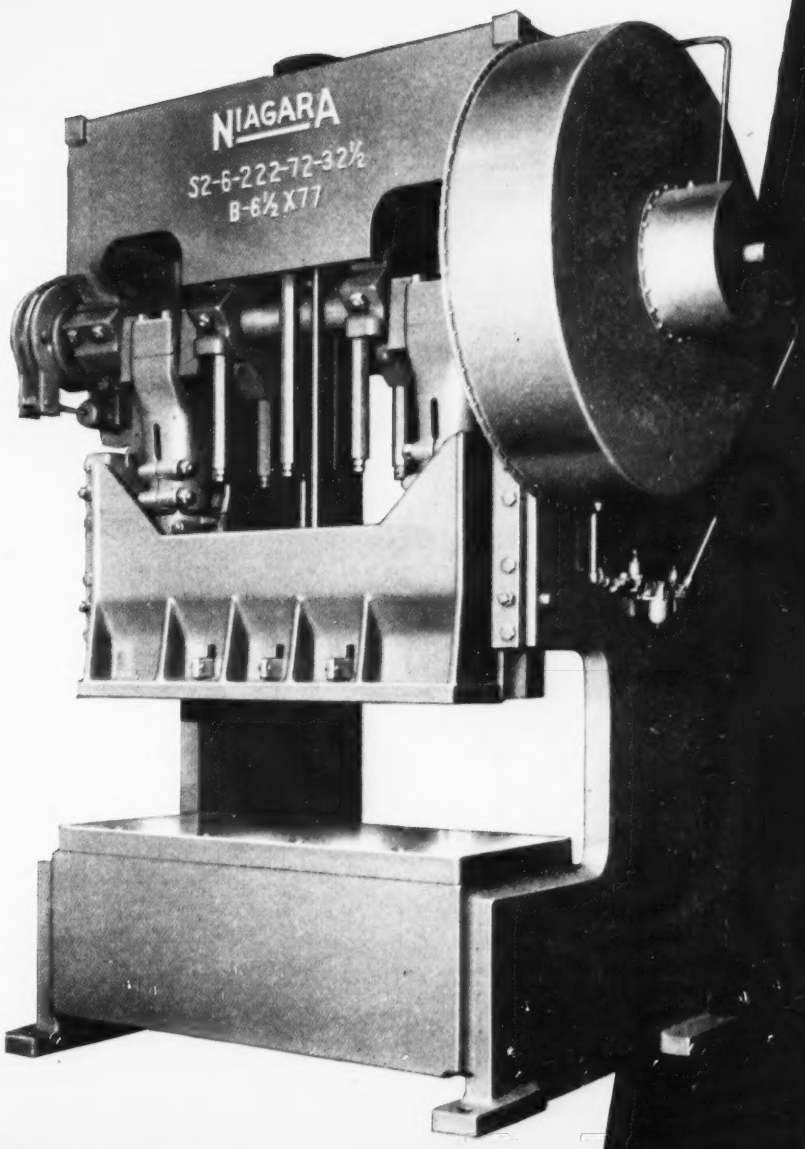
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

Manufacturers of a complete line of sheet metal working equipment ranging from small hand tools up to large power operated machinery.

Versatility and High Production

- Gap frame convenience with double crank width.
- Ideal for long progressive dies or multi-station dies.
- Rear of press open for full accessibility.
- One piece welded steel frame for maximum rigidity and long die life.
- Exclusive Niagara Sleeve Clutches for maximum productive strokes per minute and minimum maintenance cost.
- Niagara cushions for drawing operations.
- Automatic feeds for high production jobs.

Write for Bulletin



Niagara B-6½ x 77 Gap Frame Double Crank Press. Air actuated, electrically controlled sleeve clutch with friction clutch convenience and sleeve clutch economy. Air releasing brake. Clutch and gearing operating in a bath of oil. Air counterbalance for slide with surge tank over-size cylinder and pressure regulating valve to compensate for various weights of dies. Cross bar knockout in slide. V-belt motor drive.

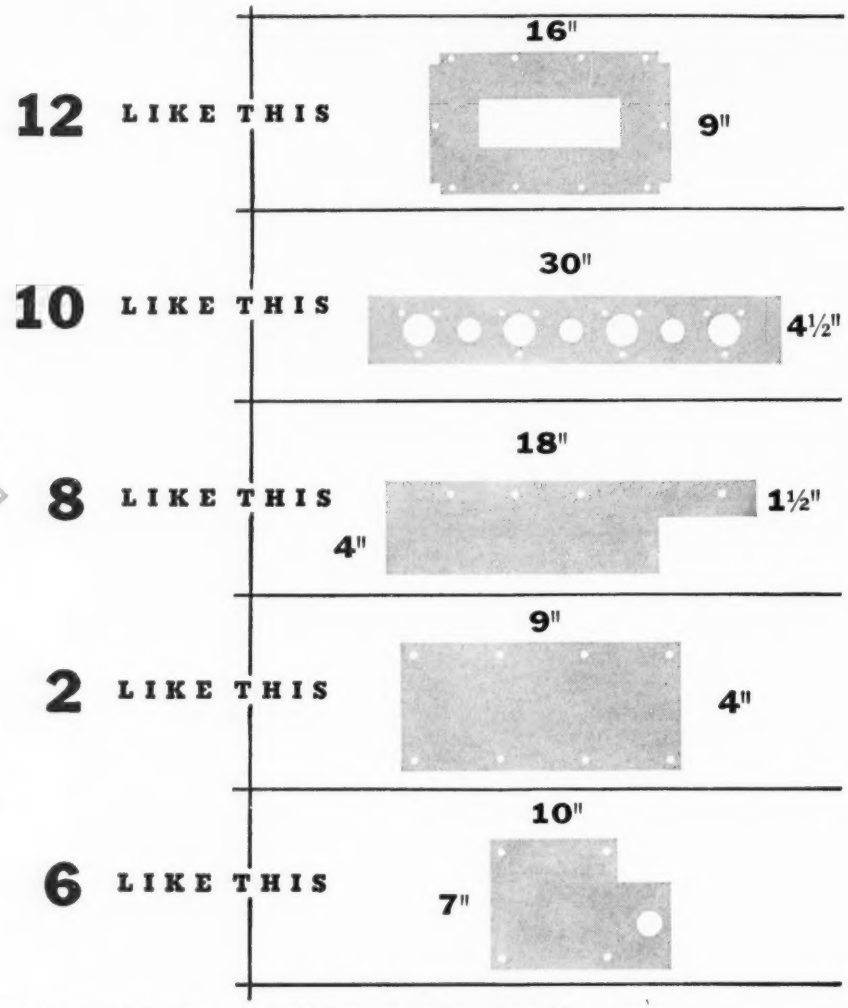
DISTRICT OFFICES: NEW YORK • CLEVELAND • DETROIT • PHILADELPHIA

with a WIEDEMANN you can

Reduce INVENTORY & STORAGE SPACE!

produce parts as required.

All
38
PIECES
were pierced in ⅛" mild steel
IN
28
MINUTES
(including all set-up)



The company producing the above parts has eliminated inventory of these and many other items; has greatly reduced inventory of punches and dies—and they no longer need to stock templates.

The Wiedemann method enables them to ship parts directly to assembly rather than the stockroom.

Items are produced weekly or more often if necessary. Sizes of parts pierced on the Wiedemann range from 5 ft. by 10 ft. down to 2" squares.

Inventory and storage reduction are just two of many cost-reducing features of Wiedemann Turret Punch Presses. We'll gladly make a time study on your own work.

WIEDEMANN MACHINE COMPANY

4205 Wissahickon Avenue, Philadelphia 32, Pa.

For more information on products advertised, use Inquiry Card, page 247



Entrance

to The World's Most Modern Gear Manufacturing Plants

...the doorway to better gears!

When your gear orders pass through this doorway, you can leave your gear worries on the doorstep.

Skilled Illinois Gear men take over immediately with the newest and finest precision gear making equipment available *anywhere.*

Your order will be filled *on time* with gears that measure up to your most demanding specifications for accuracy, finish and high quality.



ILLINOIS GEARS Reg. U.S. Pat. Off.

Gears for Every Purpose ... **one gear or 10,000 or more**

ILLINOIS GEAR & MACHINE COMPANY

2108 N. Natchez Avenue Chicago 35, Illinois

CINCINNATI SHAPERS

...serve over 2,000,000 square feet of manufacturing facilities!



In this large plant of the Scovill Manufacturing Company this battery of Cincinnati Shapers economically does a wide range of precision work on many materials, including alloys of all metals from cast iron to high acid resistant tool steel.

Tools and new machinery are produced in this department, which also does maintenance work for the entire plant. The Cincinnati Electro Magnetic Clutch and Brake also contribute to speed here, where accuracy and versatile performance are necessary.

THE CINCINNATI SHAPER CO.

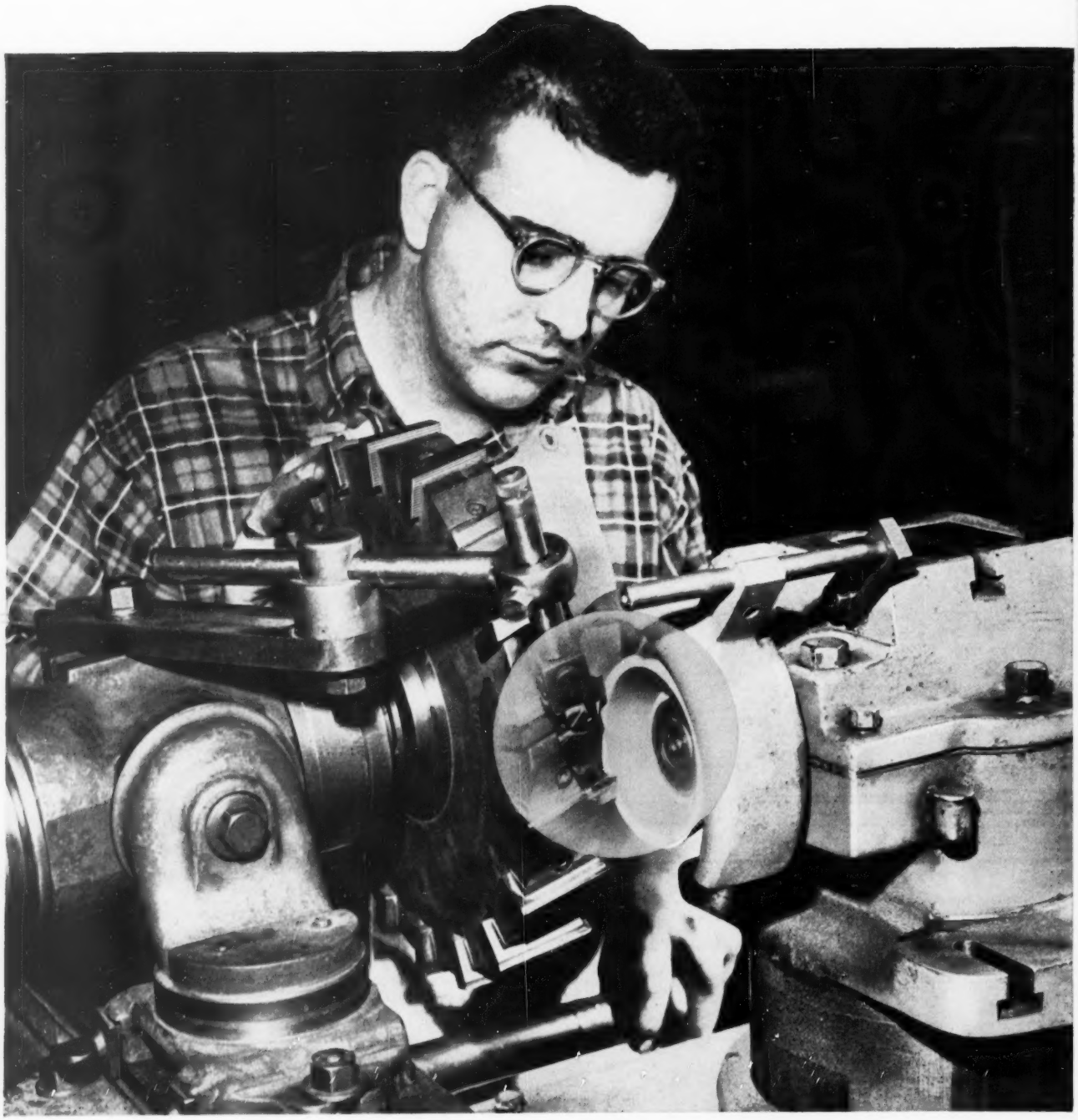
CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES



Photo courtesy Scovill Manufacturing Company, Waterbury, Connecticut.

Write for New Cincinnati Shaper catalog No. 6. Comprehensive and up-to-date, covering the complete line of these modern Shapers.

New G Bond



"Now with a G Bond Wheel we can go completely around a 16-inch face mill," writes the tool supervisor of a New Jersey plant. "Previously, due to wheel wear we had to index this type of cutter at four different positions. Now, on a finish cut, we can go completely around, and the cutter runs absolutely true within .0005 inches. These new G Bond wheels have very good, cool cutting action; don't break down or leave jagged edges . . . We'll be using plenty of them on our tool room jobs."

sets new record in tool room grinding!

Here's Proof . . . Users praise the many "TOUCH of GOLD" *advantages in Norton pace-setting wheels*

Norton G Bond wheels have sure started something! In tool and cutter grinding, as in many other forms of precision and semi-precision grinding, they're giving users an entirely new slant on how efficient, long-lasting and profitable wheels can be.

What users say about New G Bond Wheels

"Good finish, longer wheel life."
"Heavier feeds without burn."
"Run absolutely true."
"No breakdown — no jagged edges."
"Cut freely, hold shape with no burning."
"They show how a real wheel will cut."

In just a few short months the new G Bond has won its place as an important factor in the industrial picture. The most efficient vitrified bond ever produced, it was developed especially for grinding today's tougher tool steels. Norton G Bond ALUNDUM* wheels cut freer, cooler, faster. They do more work per wheel and cover a wider range of jobs. They hold corners better, are better for form grinding, dress easier and produce more pieces per dressing.

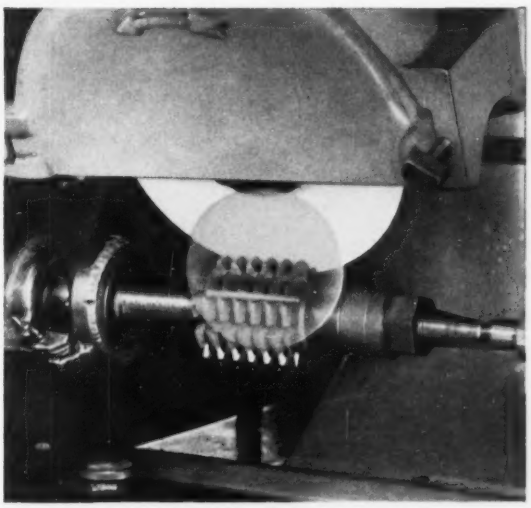
G Bond Wheels In Your Own Tool Room

will take heavier cuts in expensive, heat-sensitive steels without drawing temper. They'll reduce tool spoilage, give you closer tolerances and smoother finishes than you ever got before — with fewer wheel changes and machine adjustments . . . Those are the value-adding, money-saving "Touch of Gold" advantages that make G Bond wheels outperform any others you ever used.

Your Norton Distributor

can recommend the right G Bond wheels for your jobs. Contact him or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified 'phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries



"Better cut and less burn than previous Norton or other make wheels. We're re-ordering 250 G Bond wheels," was the comment from this Ohio tool company.

Norbide Dressing Sticks



Lengthen wheel life up to 50%. Norbide dressing sticks, of hardest man-made material, last for years, keep your G Bond and other tool wheels in top condition. W—1530

NORTON
ABRASIVES

Making better products . . . to make other products better

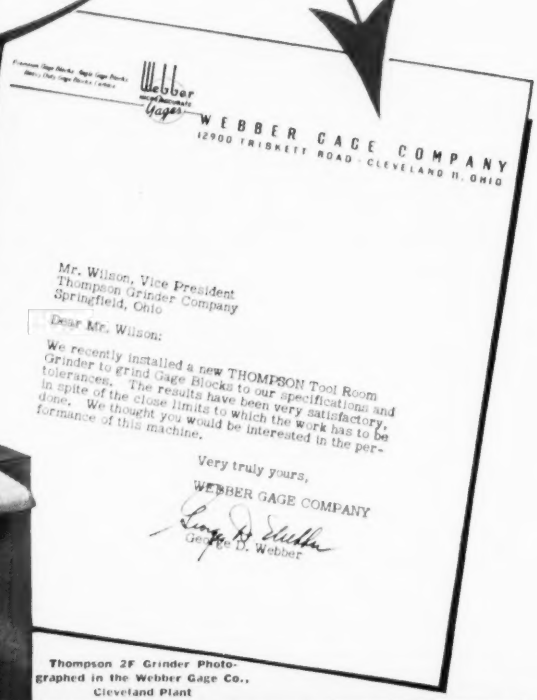
Here's Proof

The New Thompson Type 2F is a

SUPER PRECISION

Tool Room Grinder





Webber Gages

WEBBER GAGE COMPANY
12900 TRISKETT ROAD · CLEVELAND 11, OHIO

Mr. Wilson, Vice President
Thompson Grinder Company
Springfield, Ohio

Dear Mr. Wilson:

We recently installed a new THOMPSON Tool Room Grinder to grind Gage Blocks to our specifications and tolerances. The results have been very satisfactory, in spite of the close limits to which the work has to be done. We thought you would be interested in the performance of this machine.

Very truly yours,
WEBBER GAGE COMPANY
George D. Webber

Thompson 2F Grinder Photographed in the Webber Gage Co., Cleveland Plant

COMPARE THIS NEW 8 x 10 x 24 TOOL ROOM GRINDER

When working to a tolerance of four millionths of an inch such as is observed when making Webber Gage Blocks, the rough or preliminary grinding plays an important role in keeping cost of the final finishing within reasonable limits.

Compare These Features:

- HARDENED AND GROUND cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- HARDENED AND GROUND sealed anti-friction vertical slide.
- HARDENED AND GROUND BED WAYS with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated. Handy control panel.
- Elevation micrometer stop graduated in .0001".
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".
- GROUND THREAD FEED SCREW.

WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Ohio.

COPYRIGHT 1951 BY THE THOMPSON GRINDER CO.

The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

For more information on products advertised, use Inquiry Card, page 247

Introducing...

FIRST HIGH-SPEED, LOW-COST PROCESS OF COLD FORMING AND WELDING

NON-FERROUS TUBING

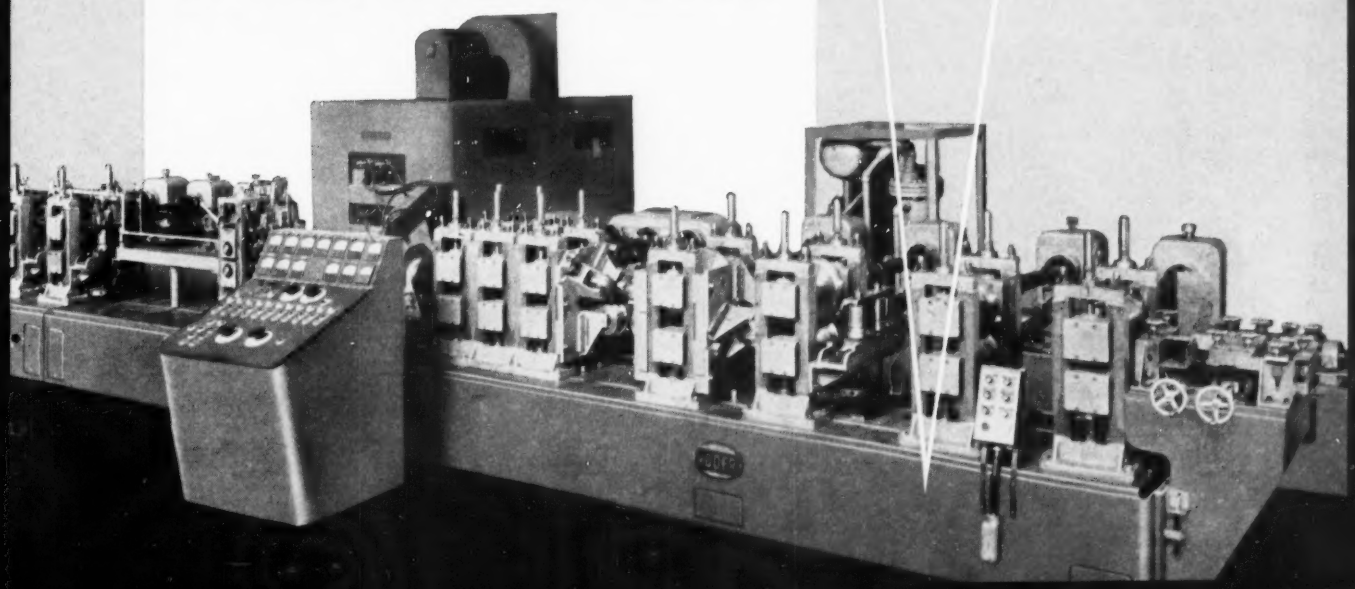
ALUMINUM · MAGNESIUM · NICKEL · BRASS AND OTHER ALLOYS

Speeds range from 30 to 120 fpm, depending on gauge and kind of metal. The process makes possible the conversion into tubing of coiled strip in gauges from 0.156" all the way down to 0.025", *without drawing and annealing*. This means drastic reduction in the cost of making non-ferrous tubing. The lighter the gauge, the greater the saving. Weld strength in many instances exceeds that of the original strength of the metal by as much as 15%.

Thus, for the first time in tube making history, through an exclusive Yoder development, coiled non-ferrous strip can be converted into high grade tubing entirely by cold process, at speeds approximating those employed in making steel tubing by resistance-welding. The story of this epoch-making development makes interesting reading to producers of non-ferrous metals as well as to manufacturers of products incorporating tubular components, both steel and non-ferrous. Send for it!

ENGINEERING YODER MANUFACTURING

THE YODER COMPANY • 5504 Walworth Ave., Cleveland 2, Ohio



Cuts Production Costs $11,549 a year

Penn Electric Switch Co. saves $7,345 per year on scrap loss alone with one 4-ton

MULTIPRESS®



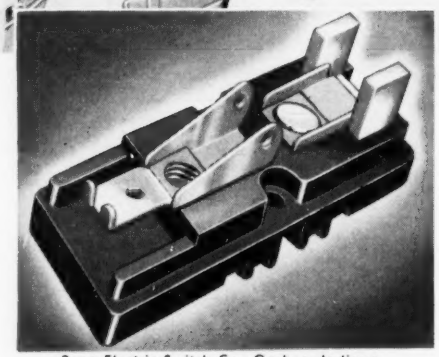
Cuts scrap loss $7345.00 per year.

Doubles production rate to 400 units per hour.

Assembles two different magnetic switches in continuous 5 to 1 ratio.

Using dual punches that stake five metal parts in a bakelite base with each ram stroke, the Multipress at right cuts scrap loss more than 80 per cent.

In addition, it speeds production to twice the former rate without additional labor time.



Penn Electric Switch Co., Goshen, Indiana, Manufacturers of Automatic Controls.

These savings on scrap and labor bring Penn Electric Switch Company a yearly gain *four times the cost of the complete Multipress, accessories, and tooling.*

Operators prefer Multipress, too, because it's quieter, safer and easier to operate, and smoother in action than previous press equipment.

The Multipress is a 4-ton model with a 6-station Multipress Indexing Table. Operators simply place the magnetic switch parts in holding fixtures at each of the six stations.

The Multipress ram delivers precisely the same pressure with each stroke—a major advantage of oil-smooth hydraulic action in reducing scrap losses. This avoids damage to bakelite bases thicker than average, and prevents loose fittings on bases of less than average thickness. An equalizing head on the ram tooling assures uniform pressure on the two punches.

A cam track within the table housing provides a means for lifting finished parts out of the fixtures. Then an air ejector blows the parts into a stove-pipe chute that carries them to the next operation.

This is another of the many factual stories of results manufacturers are getting with Multipress in every field — on a wide range of production jobs. Write for full details today . . . there's no obligation.



DENISON HydrOILics

PUMPS | MOTORS | CONTROLS | PRESSES



***MULTIPRESS* is available in 9 frame sizes — 1 through 75-ton capacities**

Standard Multipress accessories are available for many requirements . . . . manual, push-button, servo, or automatic controls and a wide choice of ram actions. See your Denison Field Engineer or write.

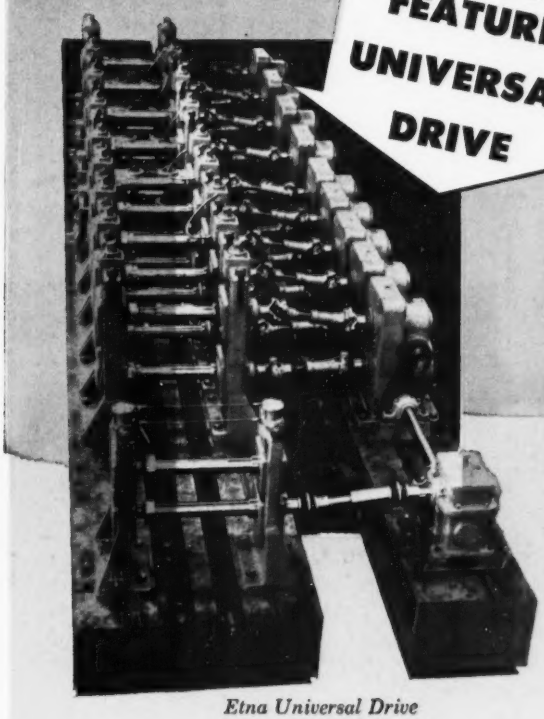
THE DENISON ENGINEERING COMPANY, 1152 Dublin Rd., COLUMBUS 16, OHIO

For more information on products advertised, use Inquiry Card, page 247

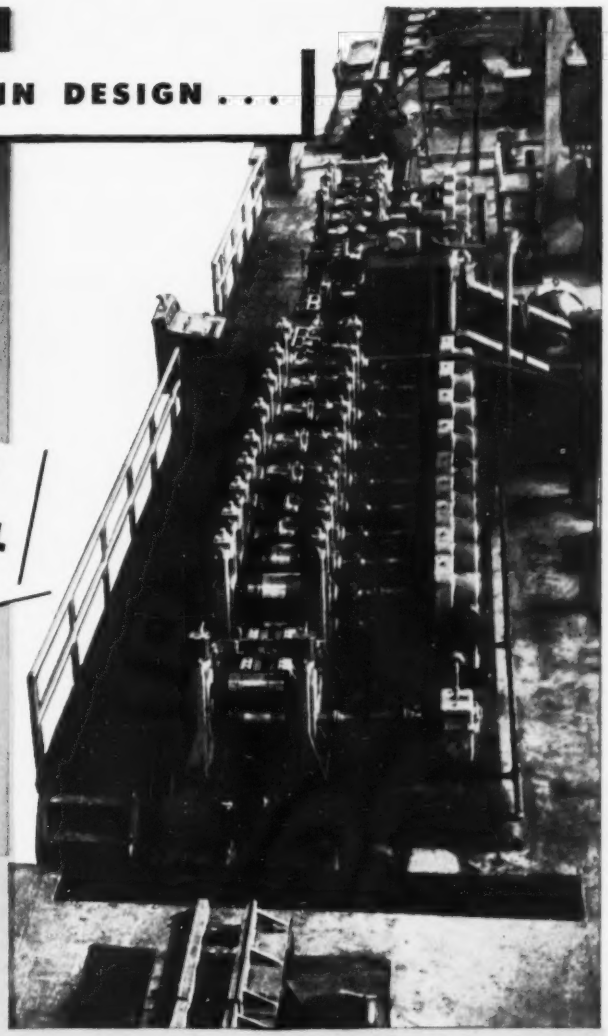
LEADING THE INDUSTRY IN DESIGN . . .

Etna TUBE MILLS

FEATURE UNIVERSAL DRIVE



Etna Universal Drive



You'll notice a trend toward Etna's modern machine design. Etna has sold more Universal Drive Mills than all other manufacturers combined. The Universal Drive provides greater accuracy in the forming of the tube, and allows an easier change from the manufacture of one diameter tube to another.

PERMANENT OIL COOLED TRANSFORMER

For greater efficiency an *Oil Cooled Transformer* is incorporated into the machine. It is a *permanent unit* and *never has to be replaced*. Cooling with oil eliminates the necessity to dry out the transformer after each days work, which is necessary when water is used as a transformer coolant. Etna Mills . . . Built for continuous operation. Write for complete details.

Abbey ETNA Company

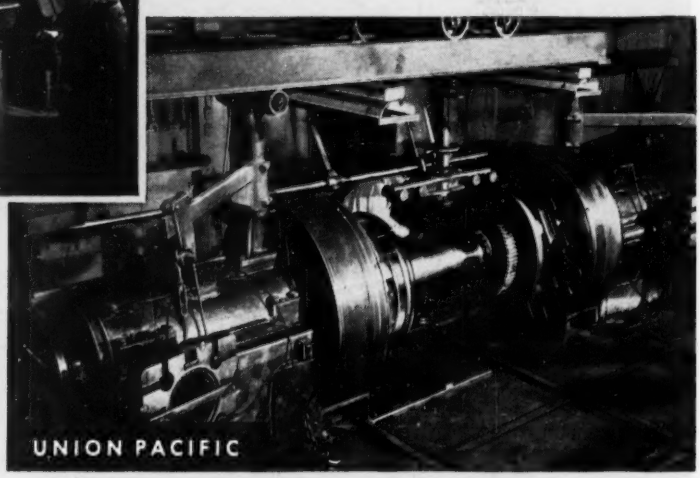
3422 MAPLEWOOD AVE., TOLEDO 10, OHIO

From Coast-to-Coast are cutting



◀ Niles car wheel borer

Fast, accurate, push-button machining means big savings in time for the Atchison, Topeka & Santa Fe Railroad. Above, a car wheel is being loaded into the Niles 48" hydraulic car wheel borer in their San Bernardino (Calif.) Shops.



▲ Niles 52" car wheel lathe

Better than 50% savings in wheel re-turning time resulted when the Union Pacific installed this Niles wheel lathe with tungsten-carbide tipped tools and profiling attachment. The UP Los Angeles Shop can turn down a wheel in about 20 minutes. Photo shows rear view of lathe finish-profiling a large wheel set.

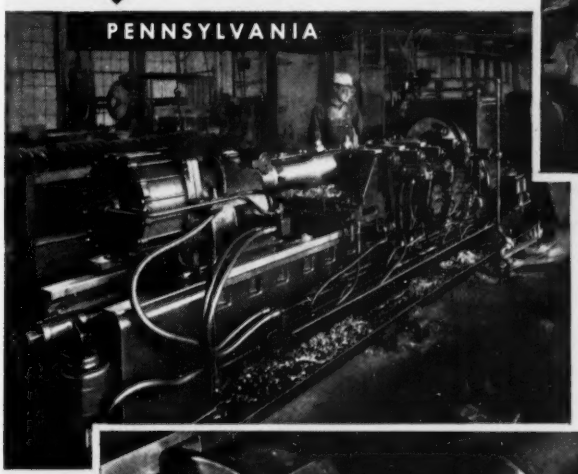
BALDWIN · BLH · LIMA-HAMILTON

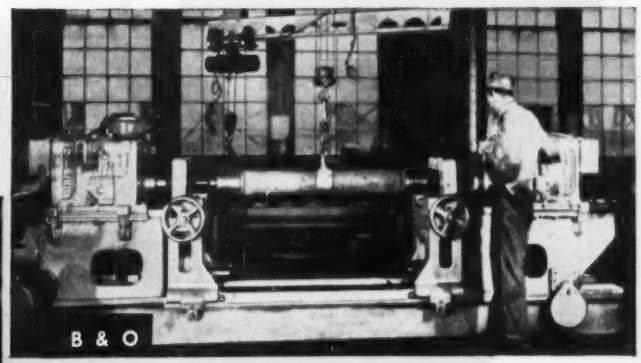
BALDWIN-

NILES TOOLS
wheel shop costs

Niles end drive axle lathe

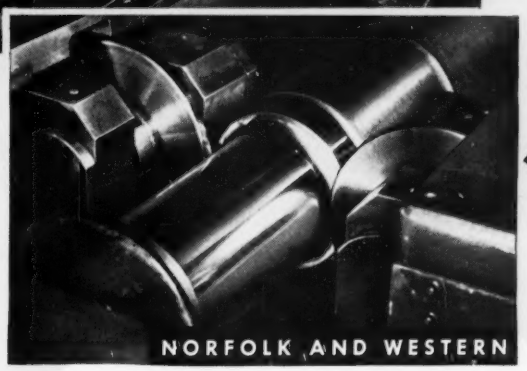
In their Altoona Shops, the Pennsylvania Railroad turns complete axles on this Niles end drive axle lathe with four carriages. This lathe has the modern controls, feeds and speeds which enable most users to machine an entire axle in less than half the time ordinary methods require.





Niles hydraulic axle centering machine

This Niles machine centers axles faster and more uniformly for the Baltimore & Ohio Railroad in their Glenwood (Pittsburgh) Shop because chucking is automatic and, therefore, more positive. Precise concentricity results in minimum waste of metal and time in machining that follows.



Niles hydraulic burnishing lathe

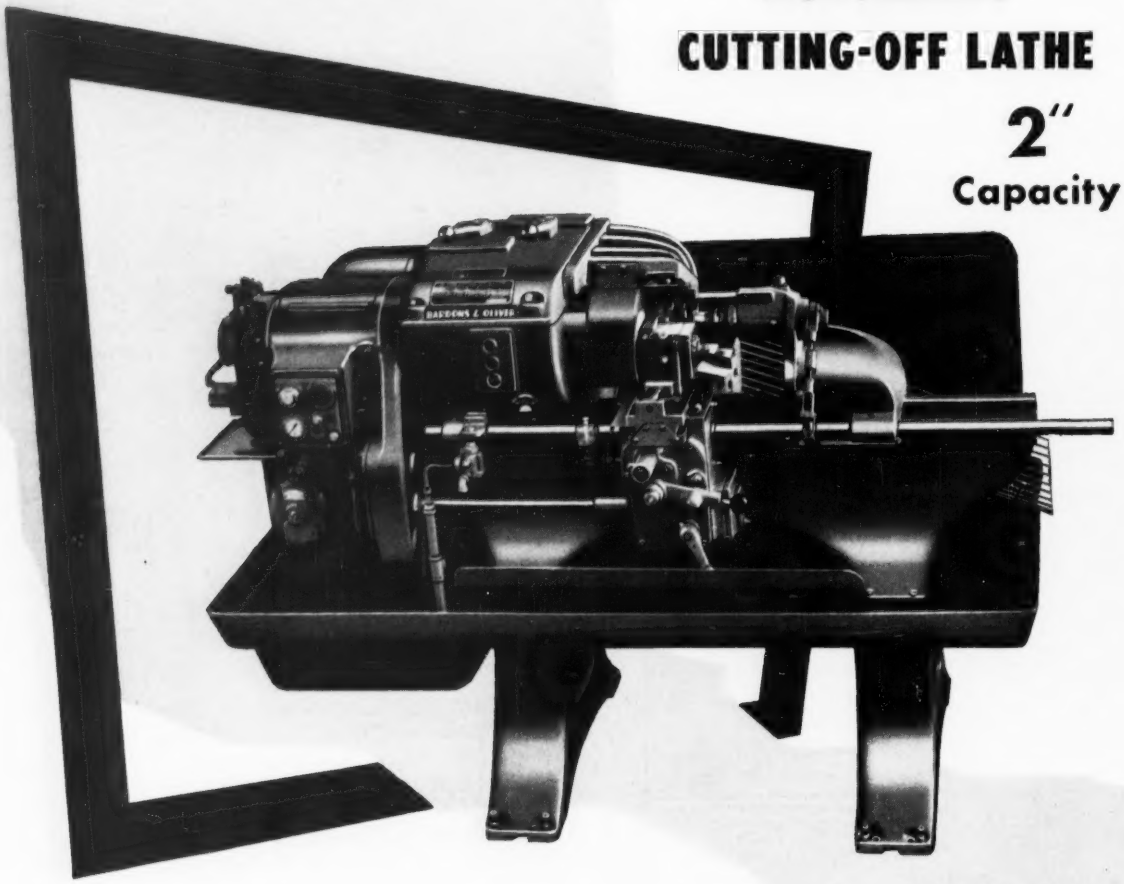
The first machine of this type built by Niles Tool Works is burnishing the outer journal of a freight axle in the Roanoke Shop of the Norfolk and Western Railway. Hydraulic power speeds all loading and adjustments, avoids operator fatigue and accidents. Photo suggests how this modern burnishing lathe produces a uniformity of finish to further reduce hot box frequency.

LIMA-HAMILTON

HAMILTON DIVISION HAMILTON, OHIO

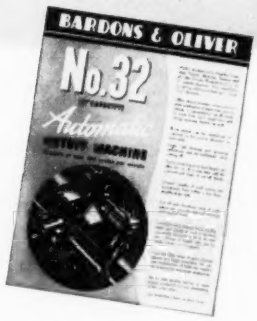
Improved...

BARDONS & OLIVER
MODEL NO. 32
AUTOMATIC
CUTTING-OFF LATHE
2" Capacity



Increased Rigidity and Sturdiness of the entire tool feeding mechanism results in more continuous production and assures a longer, accurate life of the machine.

The machine is capable of over 100 cycles per minute . . . its production *AVERAGE* is 30,000 pieces in an 8 hour day. Highly productive for nipples, couplings, ferrules, bushings, spacers, and all other tubular products.

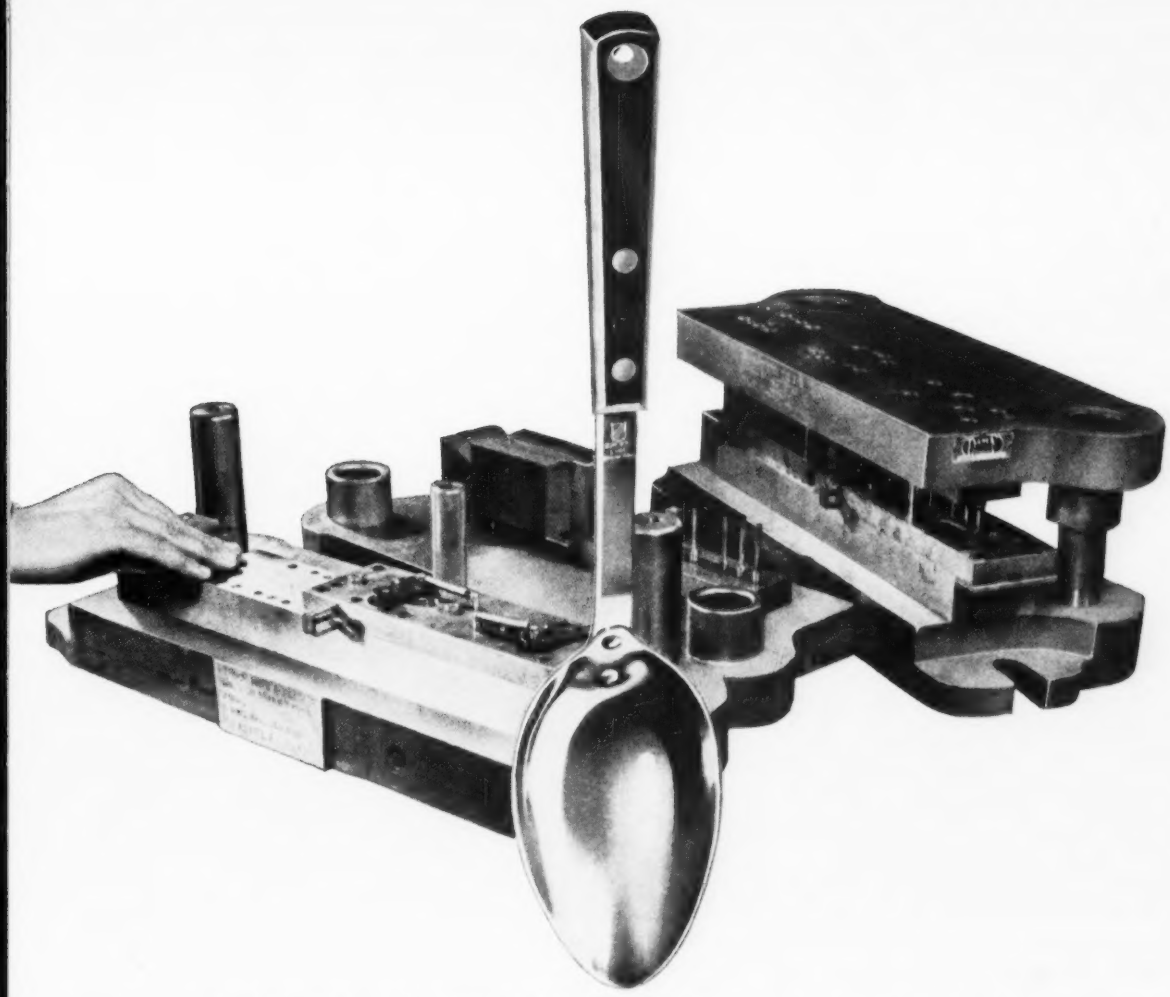


Write us on your company's letterhead for this new Catalog.

BARDONS & OLIVER, INC.

1135 WEST 9TH STREET • CLEVELAND 13, OHIO

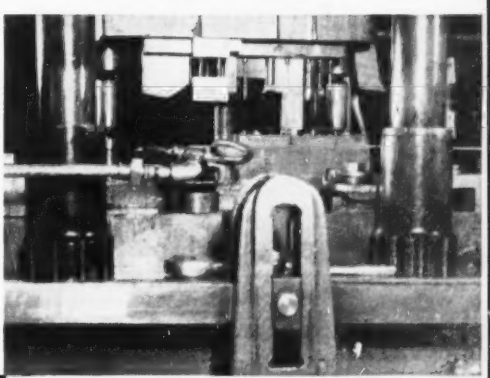
For more information on products advertised, use Inquiry Card, page 247



Ekco DEPENDS ON DANLY to save tooling time!

This popular basting spoon is one of thousands of famous household items made by Ekco Products Company in dies mounted in Danly Die Sets. Ekco depends on Danly Die Sets to save costly tooling time and help maintain uninterrupted production schedules in this highly competitive industry, because Danly Die Sets provide the finest *precision* starting point for diemaking. They are available on short notice from a completely stocked Danly assembly plant nearby.

It's a point worth remembering . . . when the job calls for *precision* performance, *depend on Danly Die Sets!* There's a Danly Branch near you . . . stocked for immediate delivery.



Call Your Local Danly Branch Today!

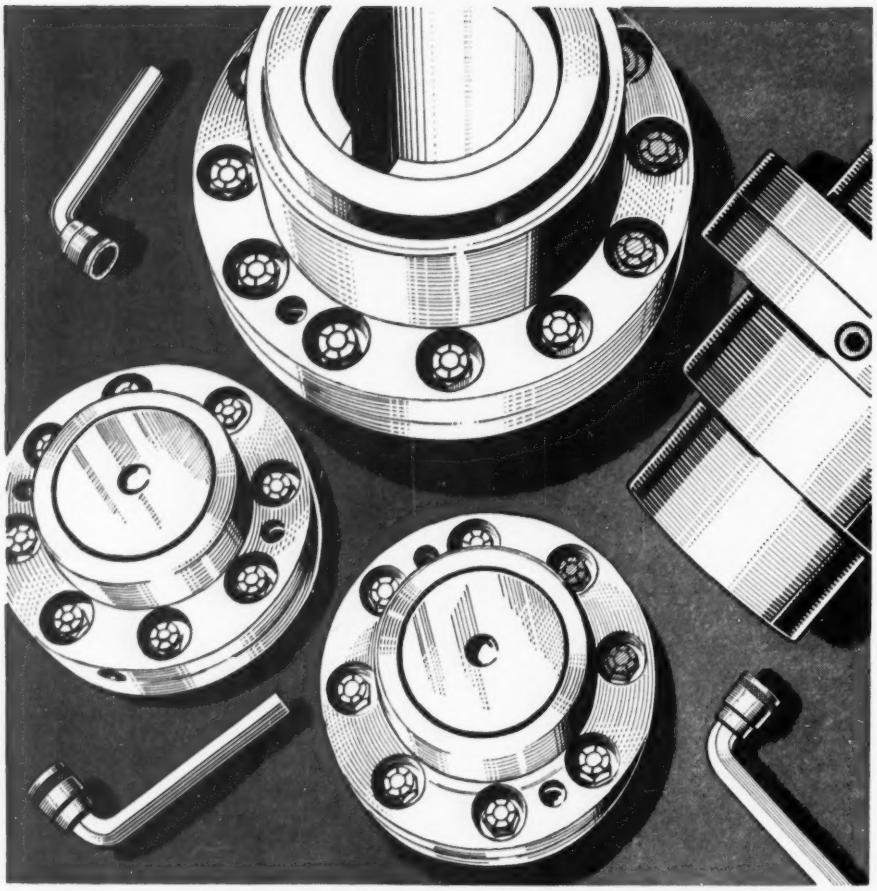
***CHICAGO** 50__2100 S. Laramie Ave.
***CLEVELAND** 14____1550 East 33rd St.
***DAYTON** 7_____3196 Delphos Ave.
***DETROIT** 16_____1549 Temple Ave.
***GRAND RAPIDS** ___113 Michigan St., N.W.
INDIANAPOLIS 4_____5 West 10th St.
***LONG ISLAND CITY** _____47-28 37th St.
***LOS ANGELES** 54_____Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2___111 E. Wisconsin Ave.
***PHILADELPHIA** 40___511 W. Courtland St.
***ROCHESTER** 6_____33 Rutter St.

**Indicates complete stock*

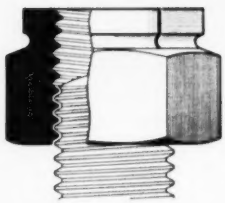
DANLY

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

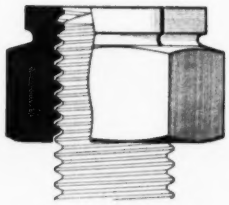
DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois



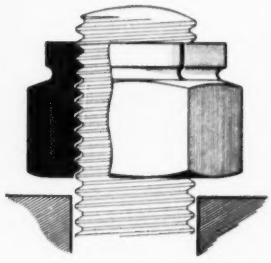
Manufacturers of couplings like these find that FLEXLOC Self-Locking Nuts provide faster assembly and safer, more dependable locking than is afforded by most other methods.



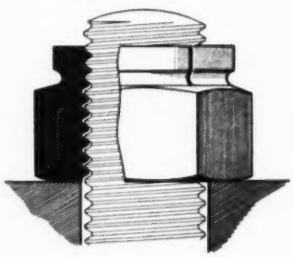
Starting. A FLEXLOC starts like any ordinary nut. Put it on with your fingers. Tighten it with a standard hand or speed wrench.



Beginning to Lock. As the bolt enters the segmented locking section, the section is expanded, and the nut starts to lock.



Fully Locked As a Stop Nut. When 1½ threads of a standard bolt are past the top of the nut, the FLEXLOC is fully locked. A FLEXLOC does not have to seat to lock.



Fully Locked As a Seated Nut. When it is used as a lock or stop nut, the locking threads of the FLEXLOC press inward against the bolt, lifting the nut upward and causing the remaining threads to bear against the lower surface of the bolt threads. Vibration will not loosen a FLEXLOC, yet there is no galling of threads.

Here's why more and more original equipment manufacturers specify FLEXLOCs

Whether it's on power transmission couplings or on access doors of helicopters, more and more FLEXLOC Self-Locking Nuts are being used to insure positive fastening of assemblies.

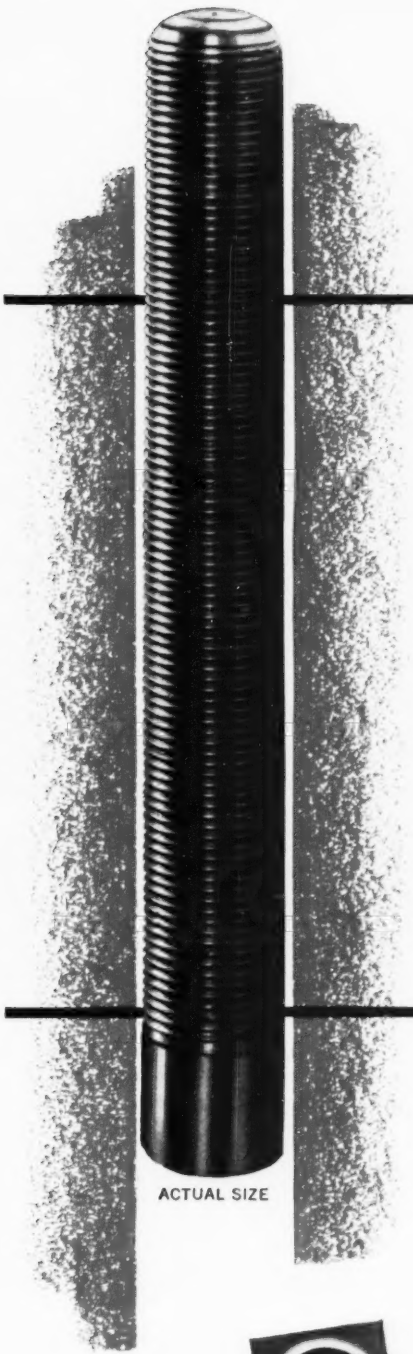
There are many reasons for this. FLEXLOCs reduce production costs. They are easy to install. They are one piece, all metal—nothing to assemble, come apart, lose or forget. They eliminate complicated, time-consuming methods of locking bolts and studs. They stay put—once their locking threads are fully engaged, they won't work loose. They are easy to get—SPS can make prompt delivery of FLEXLOCs in any quantity, and in a wide range of sizes, through a national organization of industrial distributors. Write for literature and samples. STANDARD PRESSED STEEL CO., Jenkintown 19, Pa.

FLEXLOC® LOCKNUT DIVISION

SPS
JENKINTOWN PENNSYLVANIA

For more information on products advertised, use Inquiry Card, page 247

No. 8 in a Series



ACTUAL SIZE

when the odds don't have it...

Before putting the chips down it is well to realize that reliable machine performance is largely dependent on well balanced tooling. If it is a multiple spindle bar automatic, an even number of work spindles provides a better opportunity for balance than an odd number.

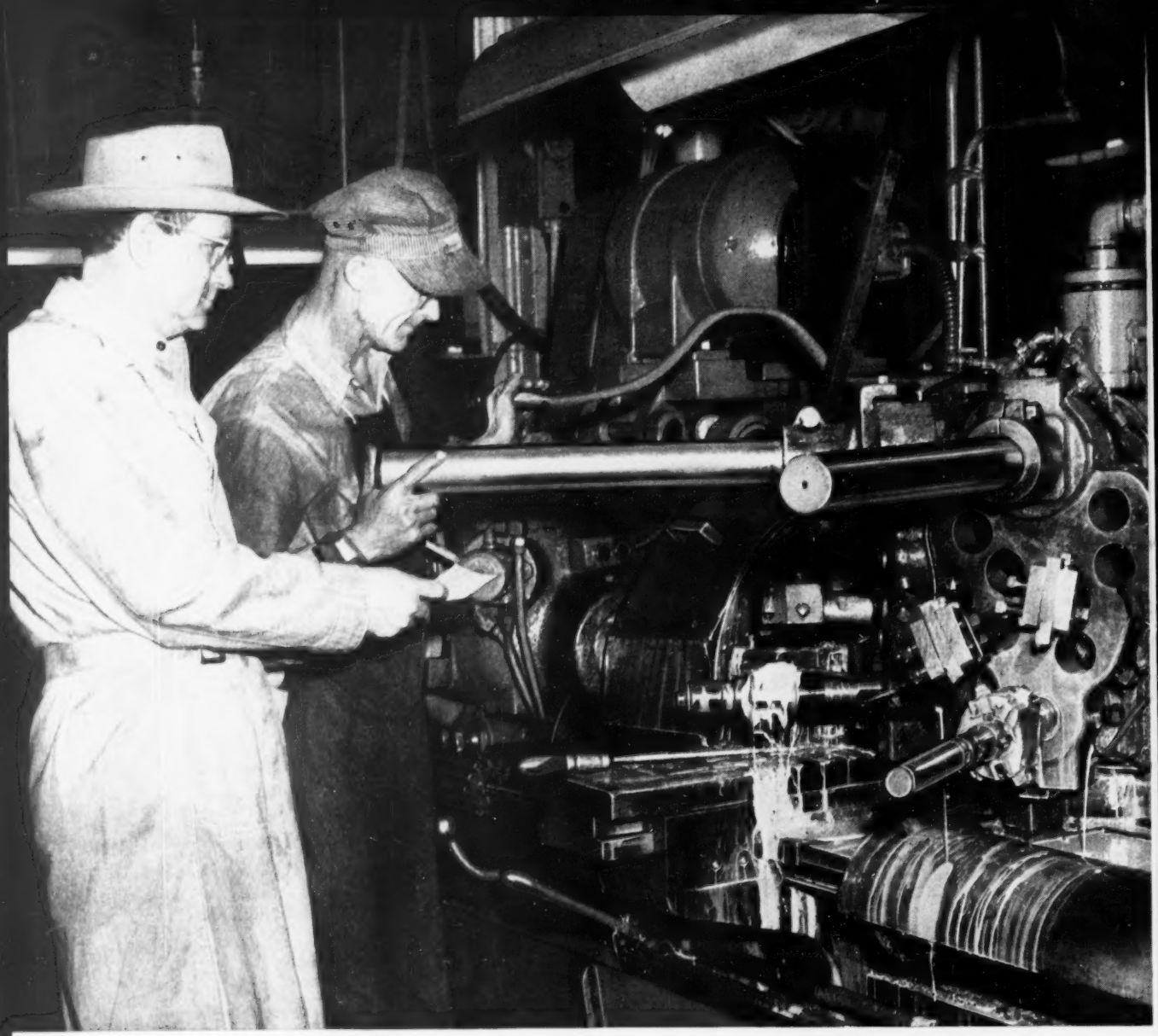
Odd or even, the work spindles are only one of many important considerations in the selection of an "automatic". Other factors also important to the individual machine user are suggested by the new Conomatic General Datalog. Copies are now available.

data for comparison

Part	**Levelling Screw**
Machine	**1⅛" Six Conomatic**
Tools	**100% Carbide Tipped**
Material	**B-1112**
Stock Size	**1" Round**
R. P. M.	**Work Spindle — 958** **Opposed Spindle — 677**
Time	**7.25 Seconds per Cycle** **3.6 Seconds per Piece**



Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



The Four Wheel Drive Auto Co. benefits 4 ways with

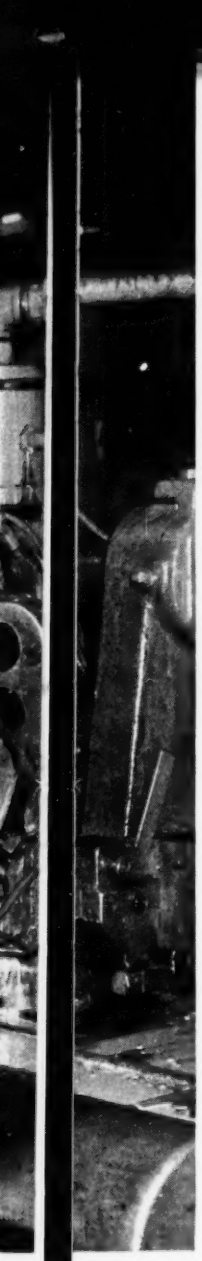
SUPERLA
REG. U. S. PAT. OFF.
Soluble Oil

• Over a period of nearly 40 years, the Four Wheel Drive Auto Co., Clintonville, Wisconsin, has used SUPERLA Soluble Oil on an increasing variety of machining jobs. Shown above is a current operation performed on a semi-automatic turret lathe. The job calls for boring and turning of 1040 steel to produce differential case assemblies.

Company officials report that on this job, as on many other jobs employing milling machines, drill presses, and grinding machines, SUPERLA Soluble Oil has provided these four important benefits: **1.** Mixes readily with cold water. **2.** Forms stable emulsions. **3.** Helps hold close clearances and dimensions. **4.** Helps provide good finish and tool life.

The long and successful experience of the Four Wheel Drive Auto Co. with SUPERLA Soluble Oil testifies to the benefits you can obtain with this outstanding coolant.

The Standard Oil lubrication specialist serving your area of the Midwest has a complete line of metalworking fluids and compounds to offer you. He also has the experience and training to help you use these products most effectively. You can reach this man by phoning your local Standard Oil (Ind.) office. Or write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.



What's YOUR problem?



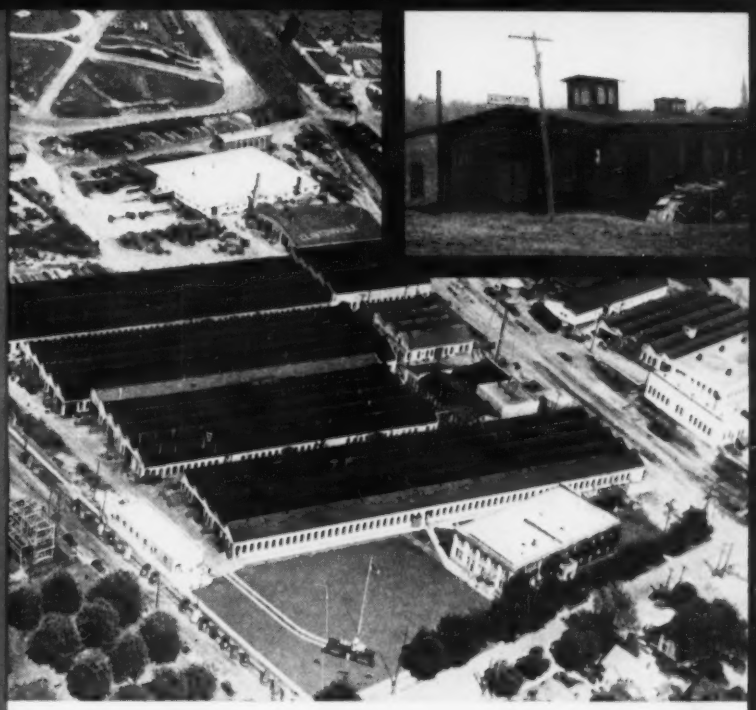
R. E. O'Brien, of Standard Oil's Green Bay office, is the lubrication specialist who works closely with the Four Wheel Drive Auto Co. to assure maximum benefits from the use of SUPERLA Soluble Oil.

He is one of many lubrication specialists who make their headquarters in Standard's offices throughout the Midwest. These men have been specially trained in Standard's Lubrication Engineering Schools and, in addition, have a wealth of on-the-job experience. The specialist nearest your plant is ready to give prompt, expert and thorough attention to your lubrication problems.

A phone call to your local Standard Oil Company office will bring this man quickly to your plant—with no obligation to you, of course.

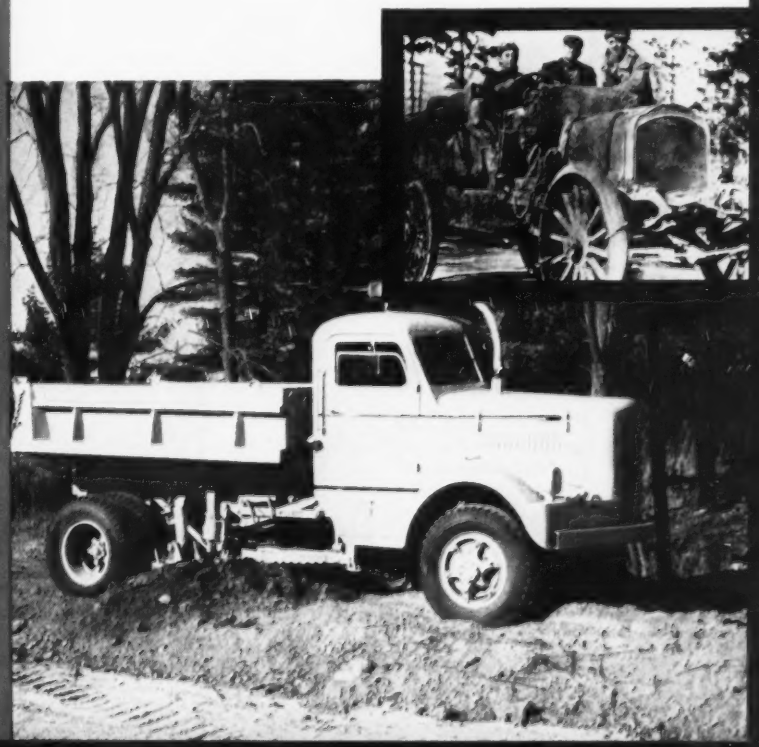
STANDARD

STANDARD OIL COMPANY
(INDIANA)



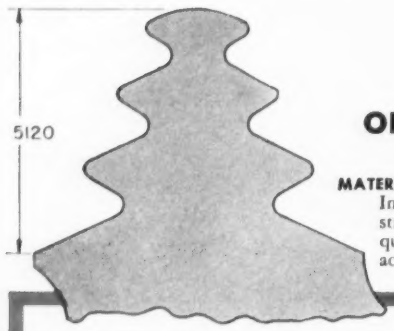
Nothing succeeds like service!

These illustrations, contrasting the past with the present, show dramatically the progress made by the Four Wheel Drive Auto Company since its organization in 1910. Service to the nation, through two world wars and in an era of great growth and progress, has won an impressive success for this company. Service, too, has won for Standard Oil an acceptance by the Four Wheel Drive Auto Company that now extends over a period of nearly 40 years.

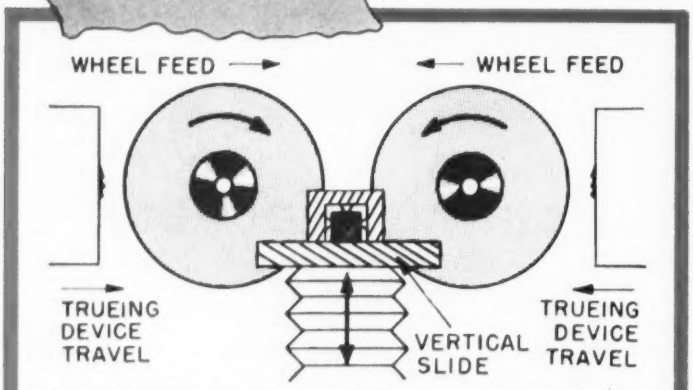


FORM GRINDING
JET ENGINE BUCKET ROOTS
FROM THE SOLID!

ON J & L DUAL-WHEEL AUTOMATIC FORM GRINDERS



MATERIAL BORDERS ON UNMACHINABLE Intense heat and great centrifugal stresses on the pressure surfaces require the toughest material and most accurate finish.



Bucket is mounted on a reciprocating vertical slide for two-way grinding.

AUTOMATICITY SPEEDS PRODUCTION — MAINTAINS REPETITIVE ACCURACY — Operation is simplified to the push button stage by a completely automatic work cycle.

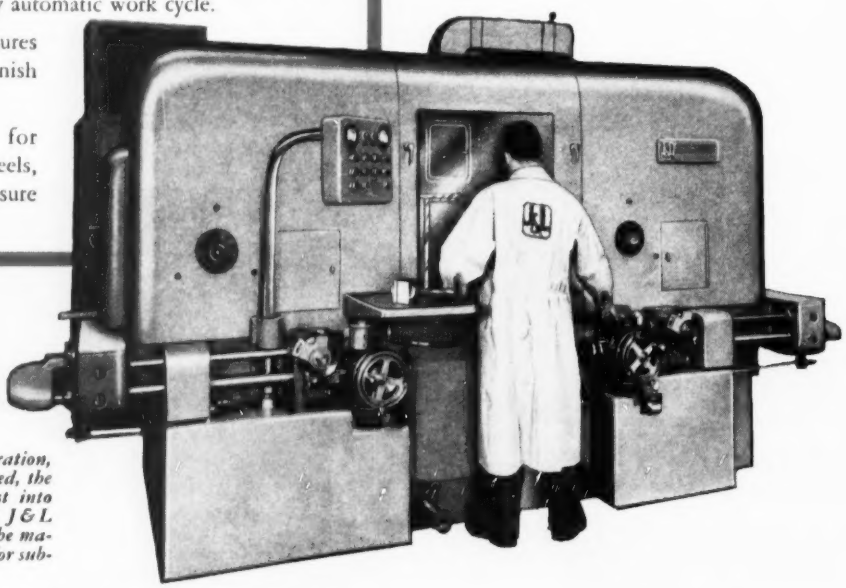
Automatic wheel trueing assures accuracy of form — includes finish trueing before final cut.

Automatic compensation for amount dressed off the wheels, and automatic wheel feed assure accurate sizing.

FEW MORE DIFFICULT GRINDING JOBS EXIST — Yet both sides of the root are ground simultaneously, to gage tolerances, on a production basis.

REPETITIVE ACCURACY MAINTAINED
Spacing of pressure surfaces within .0002
Taper within .0005
Angles within 10 minutes
Thickness from .0005 to .001

ACHIEVEMENT RESULT OF SEVERAL YEARS' RESEARCH AND EXPERIMENTATION — This application of the proven principles, long incorporated in J & L Thread Grinders, was initiated several years ago. The first machine was delivered in 1948. Continued study and subsequent refinements have helped lick one of the toughest machining problems of our day. Perhaps we can help you too.



Before the grinding operation, the foil contour is checked, the blade oriented and cast into a matrix, on a special J & L Optical Comparator. The matrix serves as a fixture for subsequent operations.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 512 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

THREAD GRINDER DIVISION

For more information on products advertised, use Inquiry Card, page 247



The fable of

The Three Brothers

HOLDS A LESSON FOR CUTTING FLUID USERS

The Fable

THREE brothers inherited equal shares of their father's farm. One brother feverishly worked his land, with seldom a rest, until prematurely worn out, he died at an early age. The second brother loafed and played until his land went to ruin and he died for want of food. The third brother, wiser than the other two, *balanced* his work and play, so that he prospered mightily and lived to a ripe old age.

The Lesson

BALANCING cutting fluids produces best results, too. The *proper balance of chemical activity* will provide the longest possible tool life consistent with surface finish desired.

Figure 1 shows abnormal front clearance wear of a single point tool due to *excessive* chemical activity of the cutting fluid used. The tool failed prematurely, just like the first brother in the fable.

Figure 2 shows abnormal cratering of a tool due to *insufficient* chemical activity of the cutting fluid used. Such cratering is usually associated with poor surface finish. This tool failed prematurely like the indolent brother in the fable.

Both of the above examples of tool failure were developed under identical conditions, except for the degree of chemical activity of the cutting fluids used.

The *proper balance of chemical activity* gives the most profitable results. For the right cutting fluids for your work, ask to have your Stuart Oil Representative call. Use the handy coupon below.



FIG. 1—Abnormal front clearance wear caused by excessive chemical activity of cutting fluid.



FIG. 2—Cratering of cutting tool, usually associated with poor finish, resulting from insufficient chemical activity of cutting fluid used.

More Than a "Coolant" is Needed

D. A. Stuart Oil Co.
EST. 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

2739 S. Troy St., Chicago 23, Ill.

In Canada: R. W. Horsey Canada, Ltd.
Subs. D. A. Stuart Oil Co., Ltd.
3575 Danforth Ave., Toronto



CLIP TO YOUR COMPANY LETTERHEAD AND MAIL

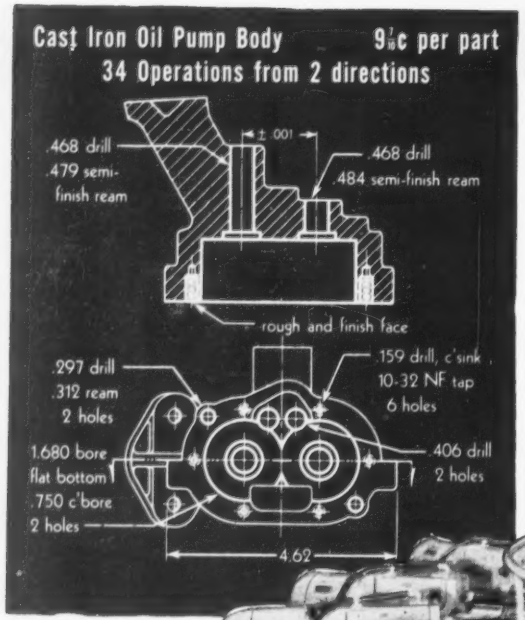
D. A. STUART OIL CO., LTD., 2739 S. TROY ST.
CHICAGO 23, ILL.

Check One ☐ Have Stuart Representative Call
☐ Send booklet "Cutting Fluid Facts"

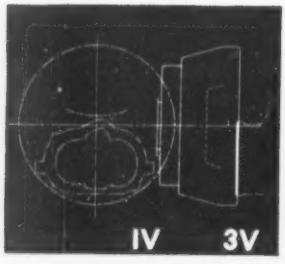
Your name .....

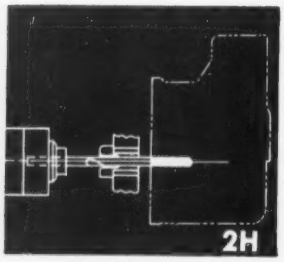
Title .....

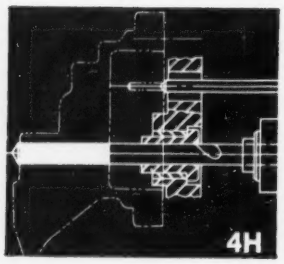
Higher production, lower

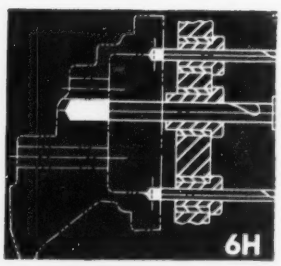


Follow this Cast Iron Oil Pump Body through a KINGSBURY









This Kingsbury accomplishes 34 operations from two directions. It mills, drills, bores, c'sinks, reams and taps. Used by a leading automotive manufacturer for a cast iron oil pump body, it produces 200 parts per hour gross; has a central column with an 84-inch base and a 60-inch index table with 14 stations. Of the 13 units, two are vertical (V) and 11 are horizontal (H). Eight of these units have multiple spindles.

Thirty-four operations are accomplished by one man on this one machine. Follow through and see:

Unit 1-V (Station 1 vertical) rough mills the base of the large flange. This milling operation employs our heaviest milling unit: about as large as we care to handle.

Unit 2-H with six-spindle head drills six .159 holes .74 deep.

Unit 3-V finish mills the face.

Unit 4-H countersinks three of the .159 holes and drills a .453 hole.

Unit 5-H countersinks the remaining three .159 holes and drills a .438 hole.

Unit 6-H drills a .406 hole and two .297 holes.

At *Unit 7-H* another .406 hole is drilled and the .297 holes are .312 reamed.

costs, soon pay for a Kingsbury

Combined operations on a Kingsbury bring you distinct advantages.

You benefit from the combined operations of a Kingsbury special purpose production machine. Output per man hour is increased. The part is not moved after once being chucked. It travels through a work cycle where units of from ½ to 5 hp each drill, ream, c'bore, mill, tap, thread, etc., accurately and automatically.

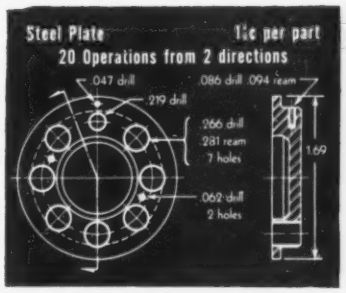
These combined operations cut production costs. Only one operator is required. He loads and unloads the machine. Handling of each part is reduced to this one chucking operation. There is almost no scrap loss — each part is machined uniformly to specifications. Less floor space is required than for separate machines.

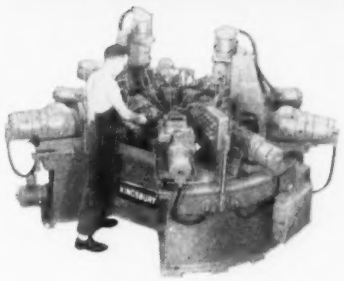
If you are interested in further information on these special purpose machines, we'd be pleased to hear from you.

Kingsbury Machine Tool Corp.,
101 Laurel St., Keene, N. H.

KINGSBURY

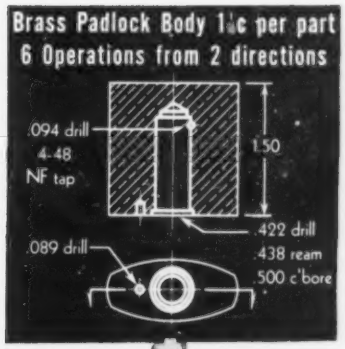
AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production

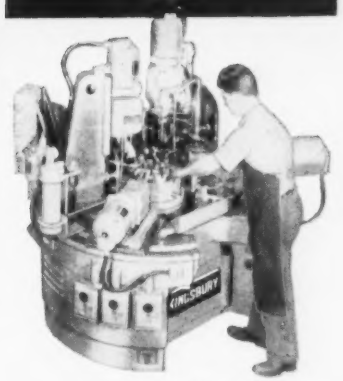




Steel Plate
540 parts per hour gross
1 6/10¢ per part

This part measures only 1.69 OD, and contains 12 holes. Most of these are partial holes. The machine has two Vertical Units and nine Horizontal Units operating 20 spindles in all. Close center distances prevent the use of more than two spindles at any one unit. Rigid tolerances must be held.

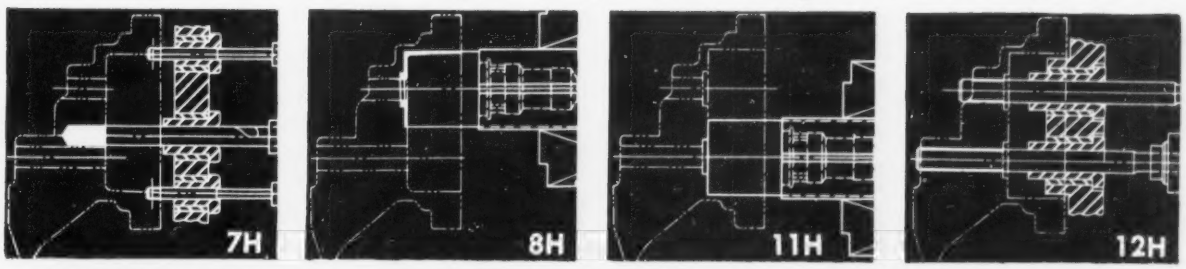




Brass Padlock Body
460 parts per hour gross
1 1/10¢ per part

This is a comparatively simple machine with six operations, four horizontal, two vertical. It drills, c'bores, reams and taps — all automatically. The machine is compact with 60" diameter base, 12" diameter index table, six fixtures and six drilling units. Bushings guide drills and reamers.

as it produces 200 parts per hour gross at 9 7/10c each



Units 8-H, 9-H, 10-H, 11-H

Here we work on the thru-holes and large bores with combination tools; really the most interesting operations. Drawings 8-H and 11-H illustrate these operations. A 1.680 hole is rough bored at both Unit 8-H and 9-H, each with a flat bottom and .750 c'bore. These two 1.680 holes then receive a semi-finished bore with flat bottom at Units 10-H and 11-H.

Unit 12-H. The .484 holes bored at 4-H and 5-H receive a semi-finished ream.

Unit 13-H with six 10-32 NF taps performs the tapping operation in the six holes drilled by Unit 2-H.

Operator stands at the 14th station when he loads and unloads the machine. An air cylinder clamps and unclamps the work fixtures.

Each Unit Cost on the drawings includes the cost of the man and of the machine — no power or overhead. We assumed:

Unit cost of man equal to:

$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross x 80\% efficiency}}$$

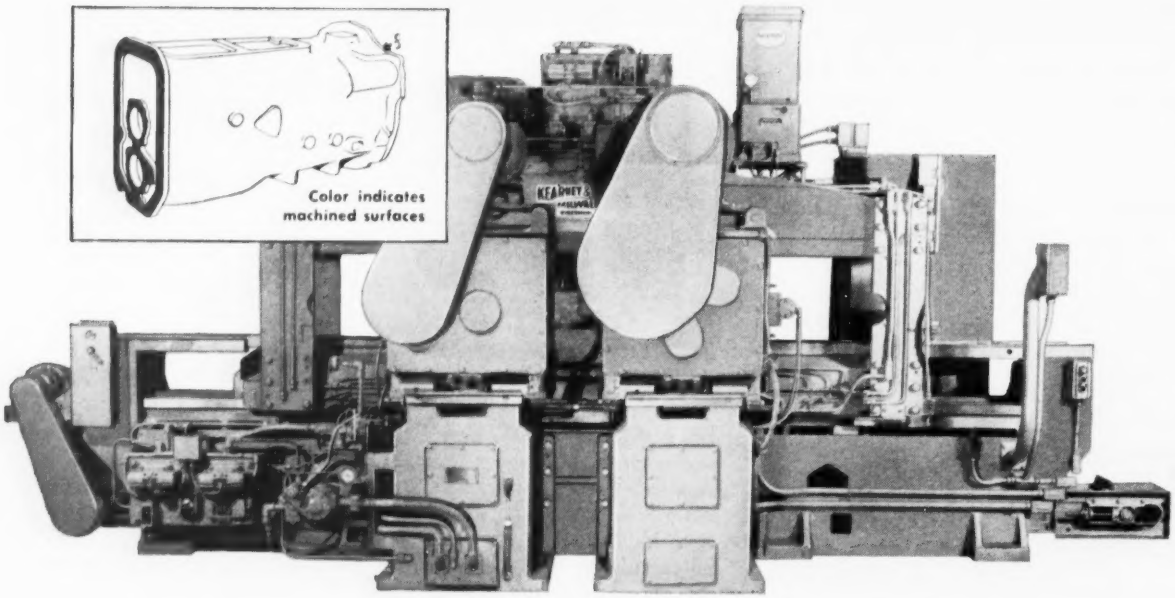
Unit cost of machine to be:

$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. @ 80\% efficiency}}$$

What a saving...



Builders of Precision and Production Machine Tools since 1898



For the customer . . . it combined four milling operations in one machine!

THIS special 6-spindle transfer type milling machine was designed and built to keep a tractor manufacturer's production line rolling at high speed. The machine now mills opposing end faces of tractor transmission cases both flat and parallel . . . to close tolerances (.002) . . . in only 94 seconds.

FOUR HYDRAULICALLY RETRACTING HEADS . . . First two heads have two spindles each for roughing. Second two heads have one spindle each for finishing.

CLAMPING MECHANISM . . . Large hollow workpiece is secured at each machining station by a tunnel-type hydraulic equalizing clamping fixture. This eliminates the distortion usually encountered when clamping this type of workpiece.

If you have problems that require special machinery—contact your Kearney & Trecker representative.



Capacity . . . Experience . . . Performance
Upon completion of this $5,200,000 expansion of our Special Machinery Division, we offer you (1) unmatched facilities, (2) experience based upon more than 50 years in the design and production of special machinery, and (3) performance, best recommended by our outstanding record of successfully solving many hundreds of unusual machining problems.



For more details on this machine . . . ask for *Data Sheet No. 1002*. Free booklet, "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking. *Write today to* SPECIAL MACHINERY DIVISION, KEARNEY & TRECKER CORP., 6784 West National Ave., Milwaukee 14, Wisconsin.

KEARNEY & TRECKER CORP. · *Special Machinery Division*
MILWAUKEE 14, WIS., U. S. A.

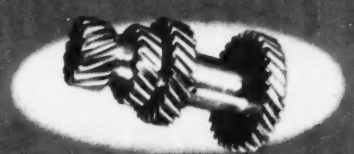
For more information on products advertised, use Inquiry Card, page 247

GEARS SHAVED in 12 to 20 SECONDS

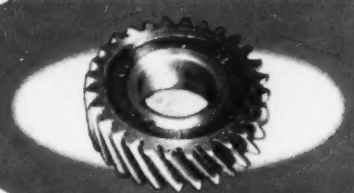
Finishing precision gears to close tolerances on tooth profile, index, eccentricity and tooth surface smoothness on Red Ring Shaving Machines is a high production operation as indicated by these random examples.



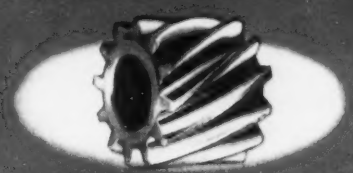
A SHAVING TIME 16 SECONDS



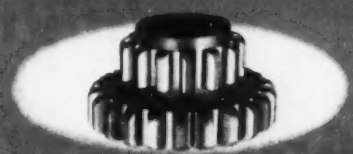
B SHAVING TIME 16 SECONDS



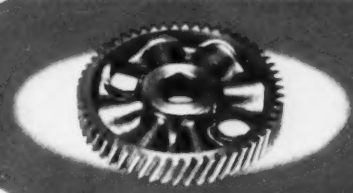
C SHAVING TIME 20 SECONDS



D SHAVING TIME 12 SECONDS



E SHAVING TIME 15 SECONDS



F SHAVING TIME 20 SECONDS

GEAR CHARACTERISTICS

Gear	Stock Removed Over Pins	Material	No. of Teeth	PD	DP	Face Width
A	.010"	Steel	19	2.4"	9.25	5/8"
B	.010"	Steel	29	4.00	9.25	1 1/16"
C	.010"	Cast Iron	28	2 5/16"	10	1 1/16"
D	.005"	Steel	12	1 1/8"	13.5	1"
E	.006"	Steel	14	2 5/16"	6/8	1 1/16"
F	.012"	Aluminum	54	5 1/16"	10	7/8"

WRITE FOR DESCRIPTIVE LITERATURE ON *Red Ring Gear Shaving*



NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

CARBOFLEX

TRADE MARK

depressed center wheels

BRAND NEW... FOR FAST, SAFE



Reduce rough welds... *fast, safely!*



Remove flash from castings... *fast, safely!*

continually putting more sense in your abrasive dollar...



Finish rough edges . . . *fast, safely!*



Cut off o· slo. . . *fast, safely!*

ROUGH GRINDING AT LOW COST

Roughing? Grinding Welds? Cutting off? Slotting?—here's a great new cost-cutter by CARBORUNDUM to help you do a fast, safe job. CARBOFLEX Depressed Center Wheels are strongly reinforced for complete operator safety, yet give you an *extra-high rate of cut.*

Here are some typical jobs where CARBOFLEX Depressed Center Wheels have proved their superiority: under-cutting and reducing heavy welds, cleaning castings, roughing off fins and sharp edges, notching and cutting off gates and risers, removing surface defects, and general purpose roughing, slotting and cutting off.

An exclusive feature of the CARBOFLEX Depressed Center Wheel: the back, as well as the face, is knurled. You can cut with either side plus the edge, without initial dressing.

The right combination of tough, top-quality abrasive grain and a strong, reinforced bond is what makes CARBOFLEX Wheels so effective. Tough, durable CARBOFLEX Depressed Center Wheels combine extreme high strength and resistance to cracking with maximum cutting ability . . . the only combination that gives you more production per wheel at less abrasive cost.

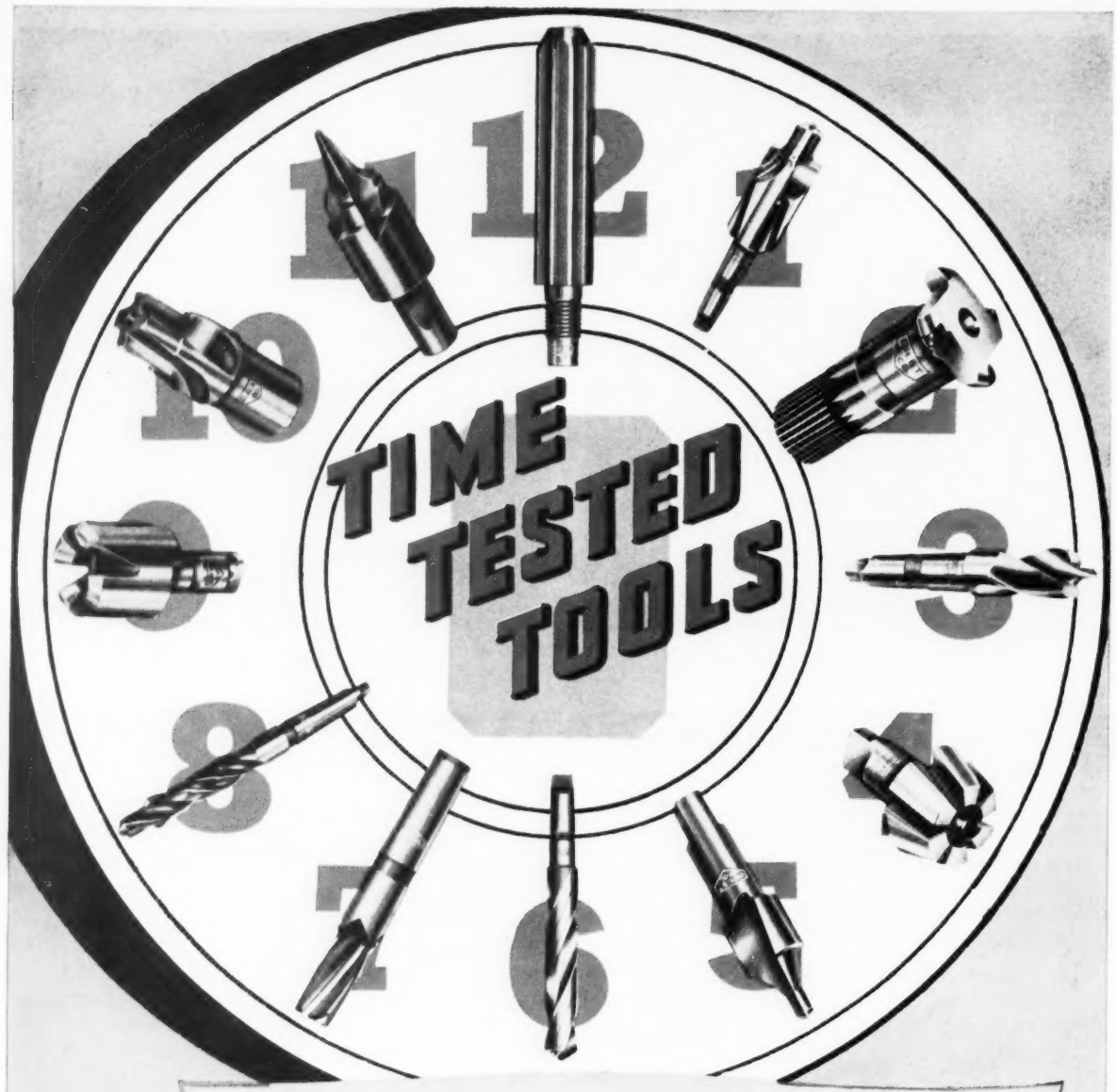
Use CARBOFLEX Depressed Center Wheels on your toughest jobs. You'll be more than pleased with the results!

● **OUR DISTRIBUTOR OR SALESMAN** is ready to demonstrate this new cost-cutter. He's listed in the yellow pages of your telephone directory—under "Abrasives" or "Grinding Wheels." Call him . . . or, if you prefer, write to The Carborundum Company, Dept. M 81-41, Niagara Falls, N. Y.

CARBORUNDUM

REGISTERED TRADE MARK

81-41



Special Tools of Quality
Engineered to Save Your Time

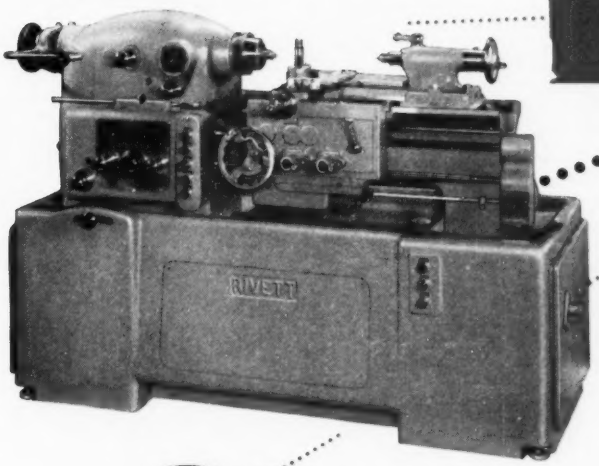
DETROIT REAMER & TOOL CO.

2830 E. SEVEN MILE ROAD • DETROIT 34, MICH.

R & T COMPANY

For more information on products advertised, use Inquiry Card, page 247

HAVE YOU LOOKED AT NEW LATHES LATELY?



New lathes may not be the whole answer to lower costs—but they will help!

You know how important it is to lower costs; and if you study the features of new lathes being offered today, you can learn how to make savings in toolroom and on production.

This observation is particularly true if you look at the new Rivett Model 1020S Precision Toolroom Lathe. It features sensitivity for turning tolerances within .0004″; and heavy biting ruggedness for a ¼″ cut at .020″ feed in cold rolled steel. In short, it is an instrument lathe and an engine lathe combined to handle any work within its 12½″ swing and 20″ centers.

Rivett offers two lathes for one!

26 Features Distinguish Rivett 1020S

The Rivett Model 1020S is head and shoulders above any ordinary lathe. Its design includes 26 individual qualities that substantiate Rivett's reputation for extreme precision and economical production.

Write for free catalog

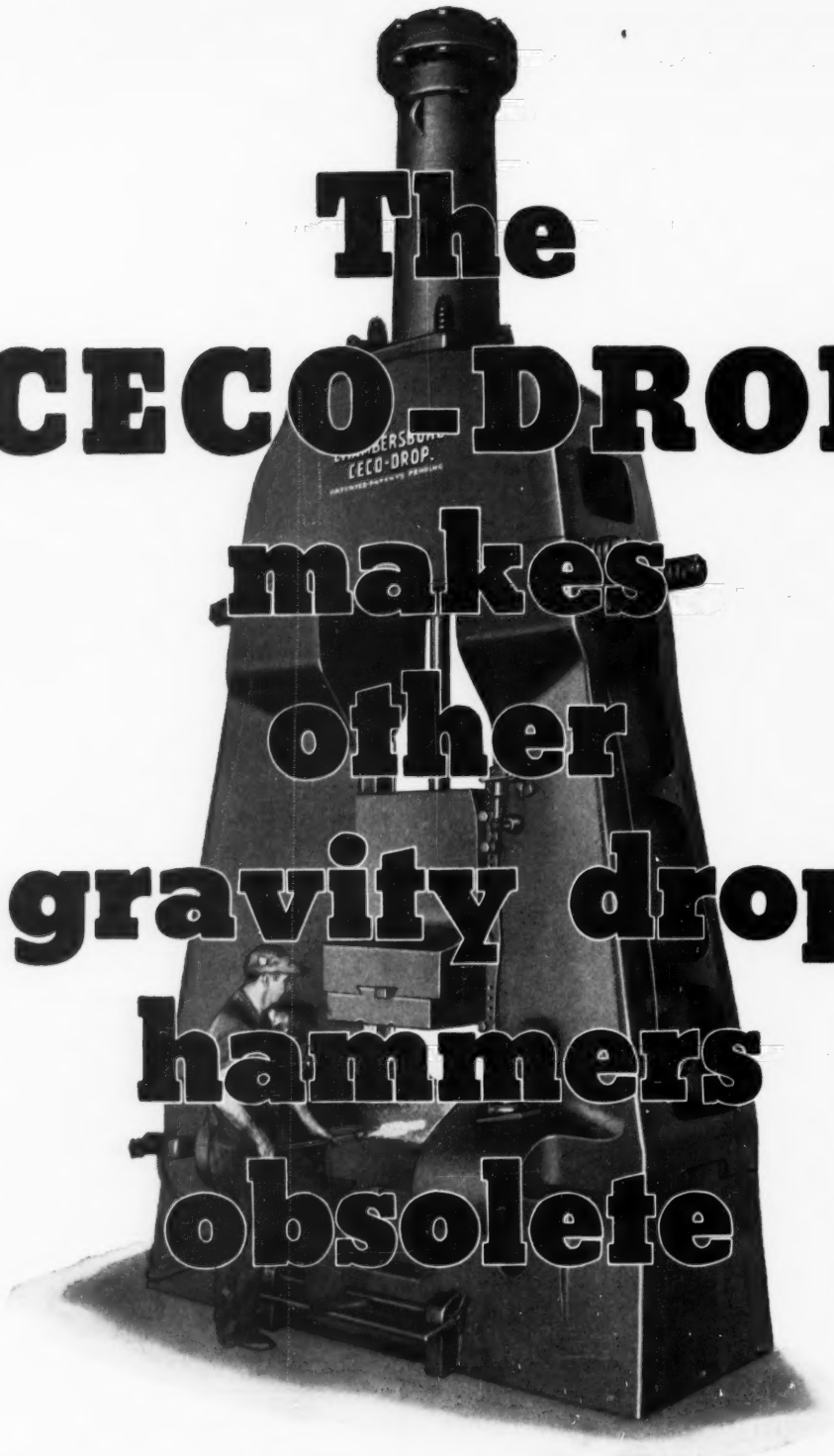
Why not write for the new Rivett Catalog 1020B and read these important 26 features—compare them with the designs of other makes of lathes—and thereby realize what a Rivett can do for your shop in the way of time and money (not to mention how happy it will make any *real* machinist to work with such *real* precision!)



RIVETT

RIVETT LATHE & GRINDER, INC., DEPT. MR-1 BRIGHTON 35, BOSTON, MASS.

The CECO-DROP makes other gravity drop hammers obsolete



Builders of THE IMPACTER

"FORGING IN MID-AIR"

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

For more information on products advertised, use Inquiry Card, page 247



They're SUPER accurate, They're SUPER finished

They're SUPERMETRIC

Precision ground all over **— including cam lug and key way slots — SUPERMETRIC chasers match the famed precision of GEOMETRIC heads. Together they guarantee precision threading. Only GEOMETRIC offers SUPERMETRIC.**

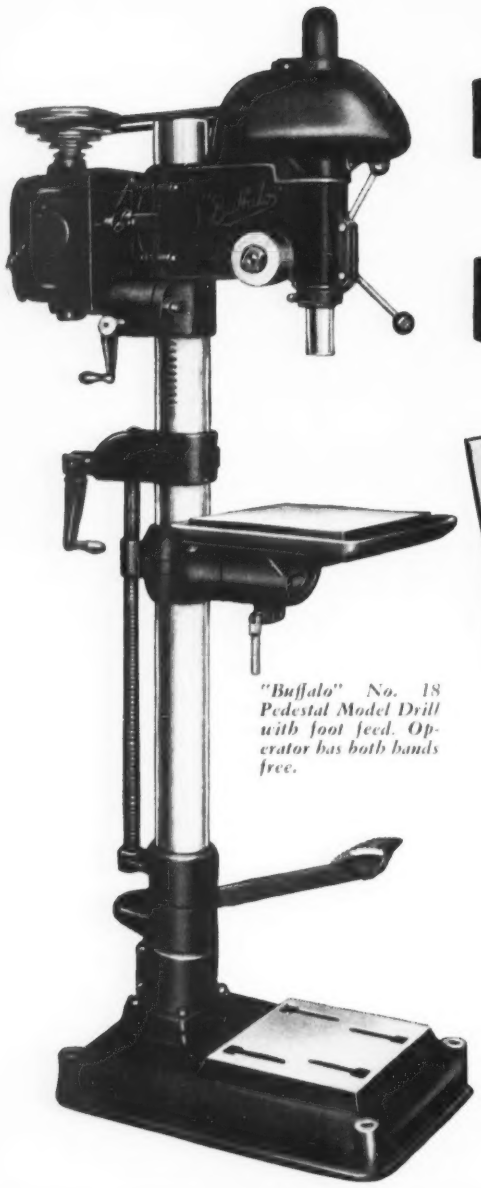
Greenfield Tap and Die Corporation

GEOMETRIC TOOL COMPANY DIVISION

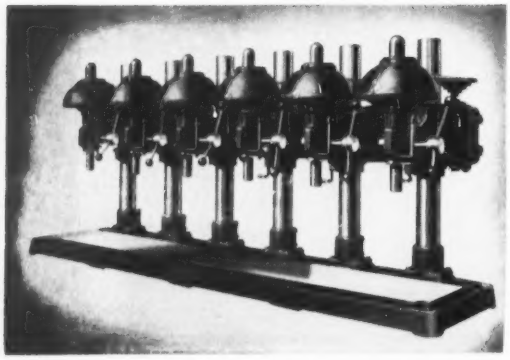
NEW HAVEN 15, CONNECTICUT

STAMINA FOR BONUS YEARS OF PRODUCTIVITY





"Buffalo" No. 18 Pedestal Model Drill with foot feed. Operator has both hands free.



"Buffalo" No. 18 Drills are available in as many as 6 spindles for operation with several setups on a production line.

. . . Yours In The Shop-Proven "Buffalo" No. 18 Drill

Its heavy-duty, precision-machined spindle runs smooth and true on ball bearings . . . free of end play . . . designed and built to stand the endless punishment of high-production work. Its feed controls are intelligently placed for minimum fatigue during long runs. Setup adjustments are easily and speedily made by convenient cranks. And you can get this workhorse drill in a choice of 12 models, in 1 to 6-spindle bench or pedestal units to suit your exact requirements. Drilling capacity, up to 1" in cast iron.

Here is a machine that is bound to hike your output, improve accuracy and reduce repairs and obsolescence to the bone. Think of the profits it could be making for your shop . . . right now! Why not write for Bulletin 3123 and investigate it further?

BUFFALO FORGE COMPANY

440 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Kitchener, Ont.

"Buffalo"

DRILLING PUNCHING

CUTTING

SHEARING BENDING

For more information on products advertised, use Inquiry Card, page 247

MEET THE CHAMP!

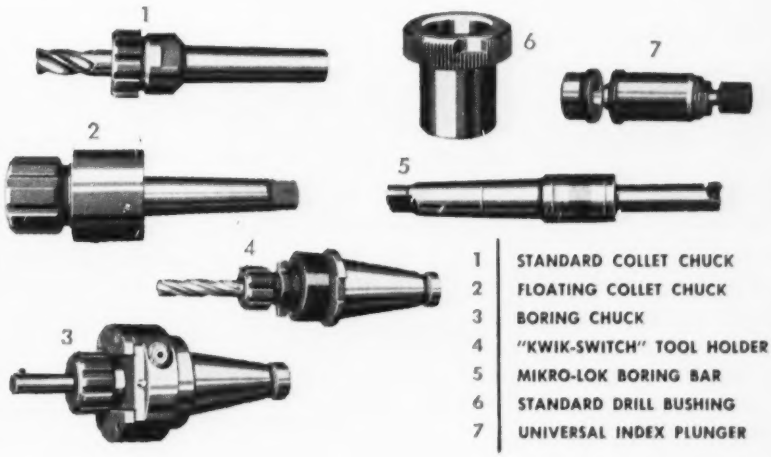
UNIVERSAL DRILL BUSHINGS BEAT ALL RECORDS FOR LONG LIFE AND ACCURACY



The extremely long life of Universal Drill Bushings is due to several factors. They are machined from finest quality steel. Their superhoned bores help to reduce both wear of the bushing and wear of the tools. Blended radius on the top inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests insure accuracy and uniform quality. Knurled heads provide a quick, sure grip. Available in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.

179

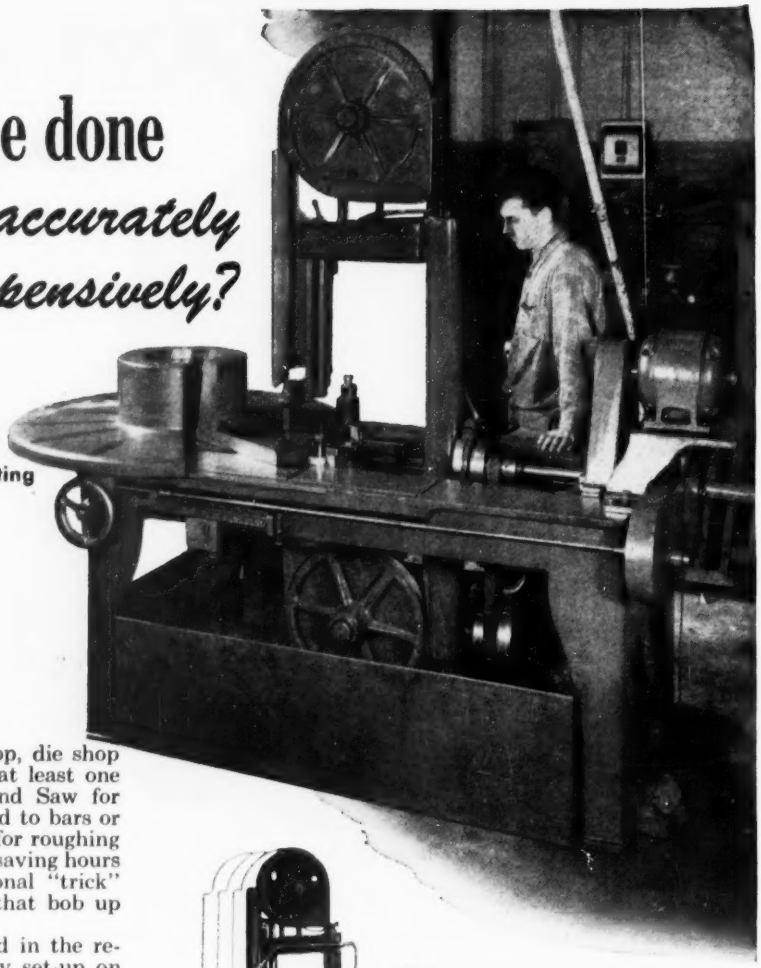
UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 2
MICHIGAN



1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER

How else could this job be done

so easily, so accurately and so inexpensively?

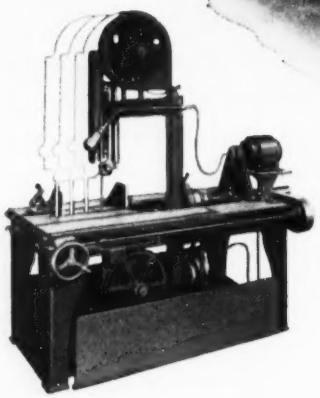


Segmentation of 42" Steel Casting

Every tool room, machine shop, die shop and maintenance department needs at least one No. 8 MARVEL Metal-cutting Band Saw for cutting off anything from ⅛" drill rod to bars or billets of 18" x 18" cross-section . . . for roughing large work to size and shape, thereby saving hours of machining . . . for those occasional "trick" jobs, impossible on any other saw, that bob up in every plant.

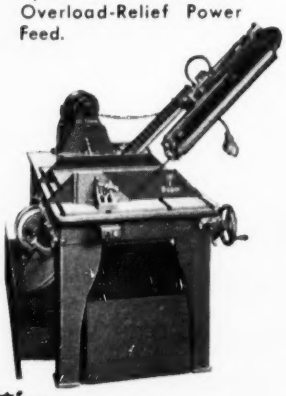
Odd shapes that can't be held in the removable, quick-action vise, are easily set-up on the No. 8's large, T-slotted work table. MARVEL Overload-Relief Power Feed insures accurate cuts under the most adverse conditions because blade pressures are automatically held within limits which are pre-set instantly for each job. The blade is never forced beyond its capacity to efficiently and accurately remove metal . . .

Close limits are further assured through the work being clamped rigidly to the bed of the saw and the blade power-fed through it instead of pushing the work through the blade. This is also true in miter cutting, as the blade column—*not the work*—is swung to the required angle. The handiest, most versatile machine tool, it is also the busiest in most shops.



This double exposure illustrates how the blade maintains its vertical position while moving into and through the work, impelled by the automatic MARVEL Overload-Relief Power Feed.





Column set at angle to cut 45° miter on 18" beam. Entire saw column can be swung to cut at any angle from vertical to 45° right or 45° left.

MARVEL *Metal Cutting* **SAWS**

Better Machines–Better Blades

Write for Catalog

ARMSTRONG-BLUM MANUFACTURING CO.

5700 Bloomingdale Avenue *"The Hack Saw People"* **Chicago 39, U. S. A.**

For more information on products advertised, use Inquiry Card, page 247

A SPINDLE YOU CAN *Specify* WITH CONFIDENCE

THE POPE PRECISION SPINDLE

1 HP, 3600 RPM MOTORIZED



with Super Precision Roller Bearings and Separate Thrust Bearings

The picture shows you why this Spindle has swept the field for 6" x 18" surface grinder application (producing finer finishes at lower cost)—and why it has been promptly drafted for hundreds of other jobs.

There are many types of bearings but none can approach the superb combination of ruggedness and precision found in the double row cylindrical roller bearings you see in this Spindle. They have tremendous load carrying capacity, produce a superior finish and assure long, trouble-free operation.

Note the thrust bearings. There is no endwise movement of the shaft in either direction.

Spindles have the Pope System of lubrication and are dynamically balanced in full assembly.

Applicable to all new grinders and to those now in service. Write for price and delivery.

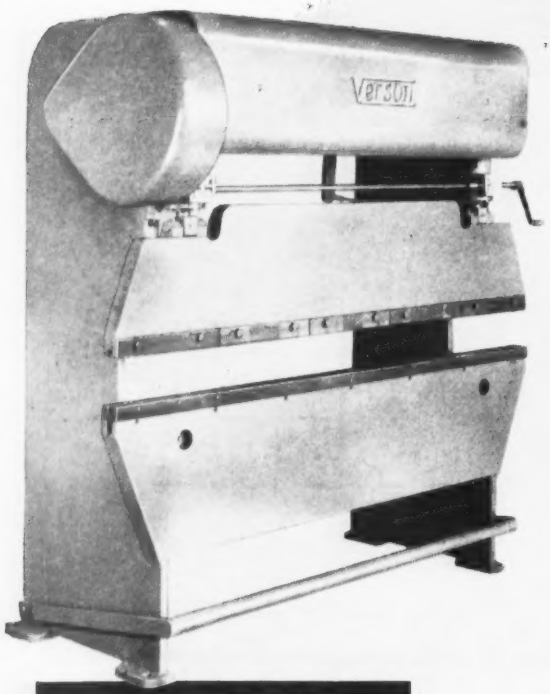
No. 95

Specify POPE® PRECISION SPINDLES

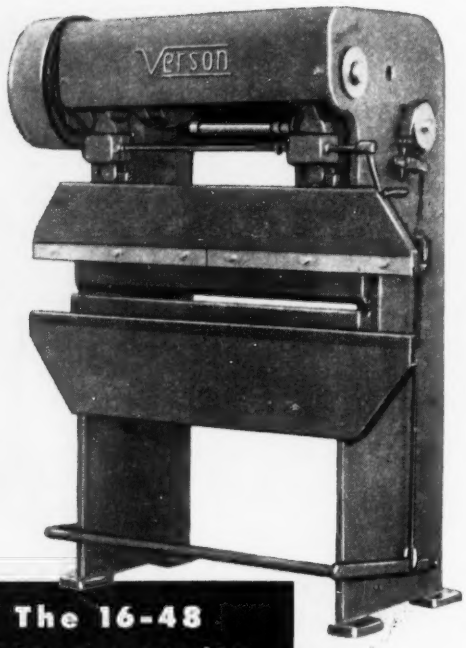
POPE MACHINERY CORPORATION
Established 1920
261 RIVER STREET • HAVERHILL, MASSACHUSETTS

Now, for the first time...

Standard Verson Press Brakes Available from Stock!



The 1062
25 tons capacity
(16 ga. x 78")
$2,190.00 as shown



The 16-48
15 tons capacity
(16 ga. x 48")
$1,455.00 as shown

Standard Dies Also Available

Standard 90° "V" dies for these press brakes are also available from stock. 78" long set for the 1062 is priced at $124.00. 48" long set for use in the 1062 or 16-48 is priced at $93.00. (Prices are for dies to handle 16 ga.)

To meet the demand for quality press brakes at modest cost and available for prompt delivery, Verson now offers two standard models *from stock*. For the small shop, it means big press standards of design and construction at prices that will fit almost any budget. For the larger shop, it means an economical answer to handling the smaller jobs without tying up big expensive machines.

Important, too, is the fact that you can order these machines as easily as buying an automobile. There is no involved proposal . . . no long delay awaiting delivery. These standard machines are offered at a standard price and shipped from stock.

Your Verson dealer can give you further information or write direct.

A Verson Press for every job from 60 tons up

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

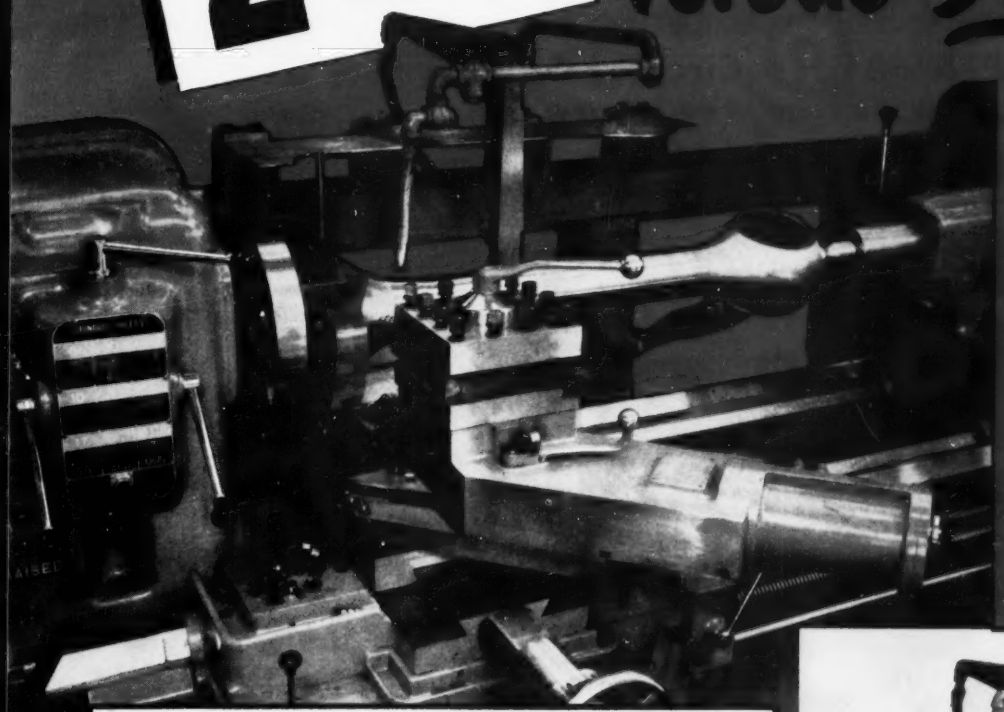
VERSON ALLSTEEL PRESS CO.

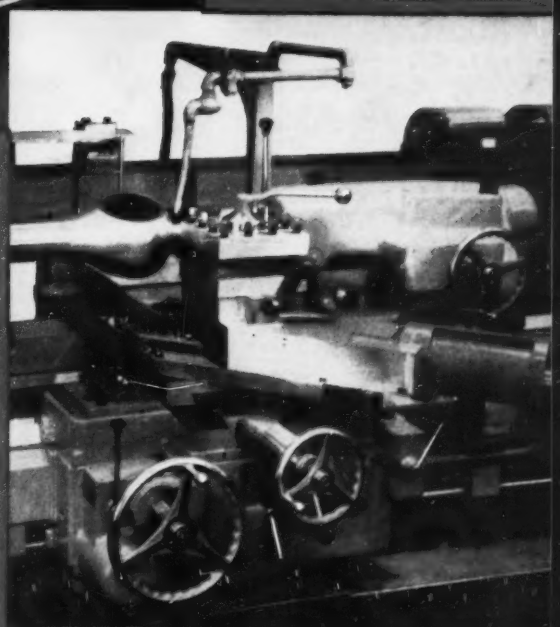
9309 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON WHEELON HYDRAULIC PRESSES

For more information on products advertised, use Inquiry Card, page 247

2 hrs. versus 9½ hrs.





This marine Diesel engine connecting rod is now roughed and finished from the rough forging in exactly 2 hours. It formerly required 9½ hours to do the same job.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

More production per man hour is the answer and the only answer to prohibitive costs—modern, high production machinery is the answer to greater production per man hour.

The astounding saving on this connecting rod job is the result of transferring it from previous equipment to a new 32-inch "AMERICAN" Hydraulic Duplicating Lathe. Such savings as this are not the exception but the rule when "AMERICAN" Duplicators are put on the job.

Bulletin No. 35 shows many such examples—it's yours for the asking.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

USE MOTCH & MERRYWEATHER ENGINEERING

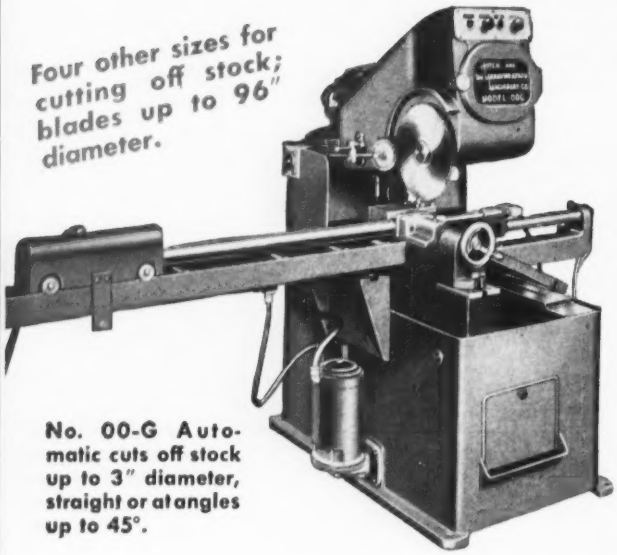
• These pages can only hint at the variety and scope of machines now being made available to you through Motch & Merryweather engineering. Each machine has been designed only because it performs a present operation better or *unitizes* operations to advantage. To further cost-saving and automation in your production program, call on Motch & Merryweather's 50-year background.

USE AN EXPERIENCE REACHING BACK 50 YEARS IN THE MANUFACTURE AND SALE OF MACHINE TOOLS

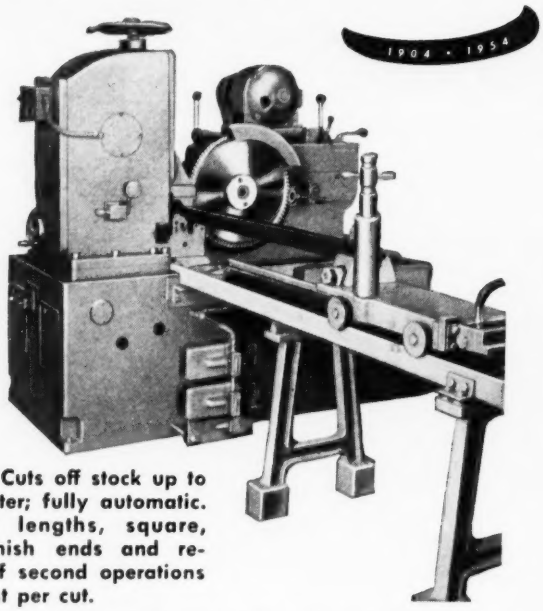
MOTCH & MERRYWEATHER Circular Sawing Machines

to cut off every size and shape of stock, ferrous or non-ferrous.

Four other sizes for cutting off stock; blades up to 96" diameter.



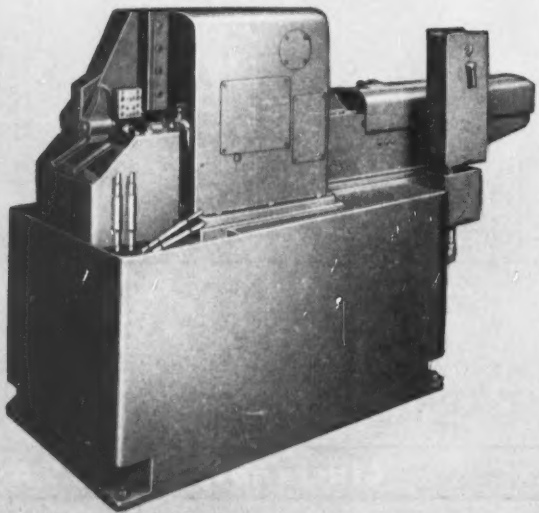
No. 00-G Automatic cuts off stock up to 3" diameter, straight or at angles up to 45°.



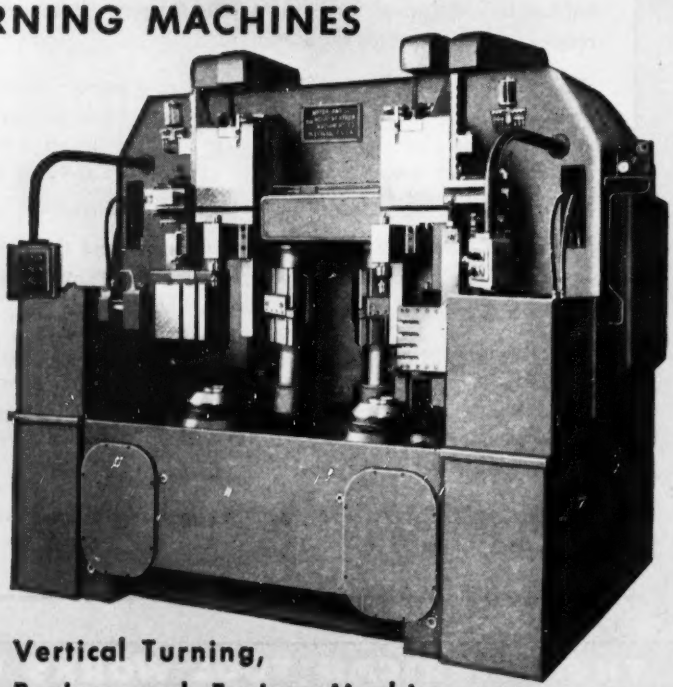
No. 2-A. Cuts off stock up to 6" diameter; fully automatic. Accurate lengths, square, milled finish ends and reduction of second operations lower cost per cut.

Motch & Merryweather TURNING MACHINES

Cam Automatic Forming Machines



Single- and double-spindle models. Hopper loading or bar feeds. All movements actuated by single cam shaft.

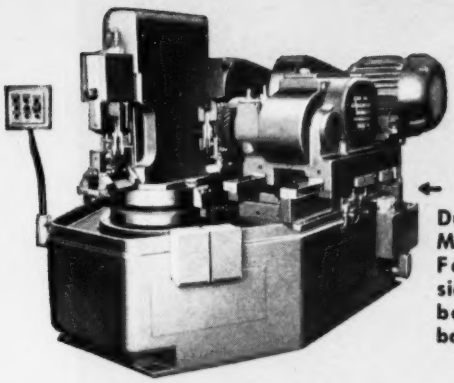


Vertical Turning, Boring and Facing Machines

Single- or double-spindle. Multiple tool blocks hydraulically fed with automatic sequence for maximum metal removal.

FOR PROFITABLE PRODUCTION THROUGH DESIGN

Heavy Duty Production Milling Machines

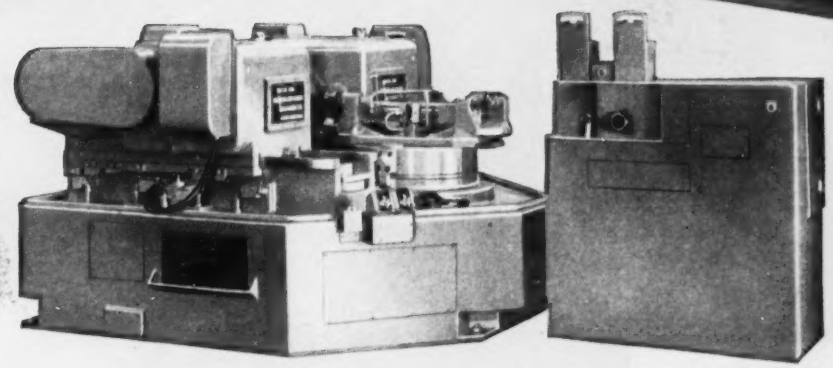


Duplex Production Milling Machine. Face mills both sides of tractor side bars. Up to 268 bars per hour.



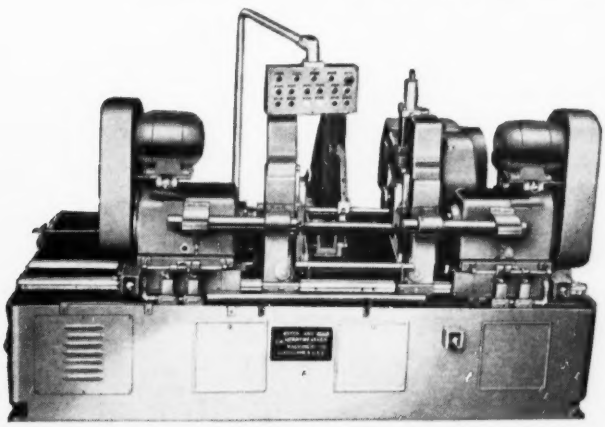
Milling and center drilling unitized. Face mills and center drills both ends of pinion shaft. Up to 230 shafts per hour.

Weight-balance milling machine unitizes weighing and subsequent metal removal. Face mills weight boss on each end of automotive connecting rod. Up to 300 pieces per hour.

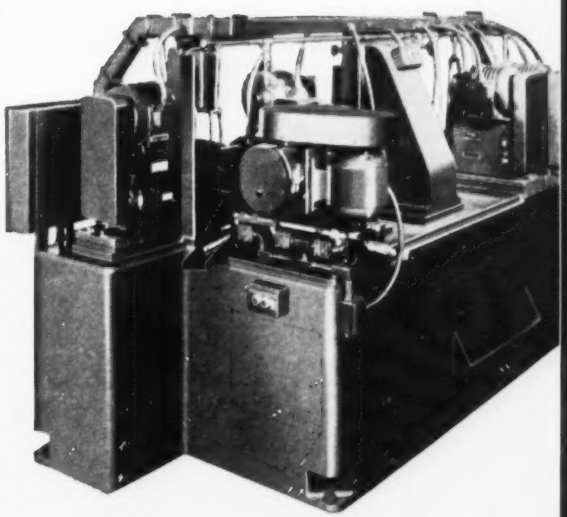


M. & M. TRANSFER MACHINES

for bar stock cut-off and double-end machining, tailored for individual requirements.



Cut-off operation simultaneous with double-end machining. Models for stock ½" through 6" diameter, lengths 8" through 40". Many forms and combinations of double-end machining.



Unusual combination of machining operations in one unit: drill, countersink, broach, cut-off, chamfer.

Manufactured by — THE MOTCH & MERRYWEATHER MACHINERY CO. —
CLEVELAND 13, OHIO

Builders of Circular Sawing Equipment, Production Milling, Turning and Special Machines

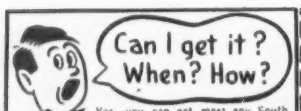
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD



SPECIFICATIONS

Hole through spindle	1⅜"
Maximum collet capacity	1"
Swing over bed	16¼"
Spindle speeds (Approx.)	20 to 945 r.p.m.
Effective feed of turret	5⅞"
Diameter of holes in turret head	1½"
Thread cutting range	4 to 224 per in.
Motor required (Two-Speed)	2 - 1 h.p.

The South Bend No. 2-H Turret Lathe has the stamina for exacting close-tolerance work, rigidity for producing fine finishes and ample power for smooth performance. It also has full quick change gear mechanism providing 48 power feeds for the turret ram, 48 power longitudinal feeds for the universal carriage and 48 power cross feeds for the double tool cross slide. The wide selection of feeds insures maximum machining efficiency on every type of operation. Where can you find a better turret lathe value?



Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

Three ways to order:

1. See or telephone nearest distributor.
2. Order by mail from your distributor.
3. If no distributor is nearby, order direct from factory.

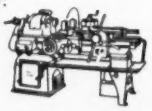
South Bend machine tools with accessories may be purchased on convenient terms up to 12 months.

PLEASE SEND INFORMATION CHECKED:

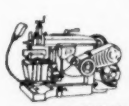

☐ 9" and 10" BENCH LATHES


☐ 10" to 16-24" FLOOR LATHES


☐ DRILL PRESSES


☐ ½" & 1" Collet TURRET LATHES


☐ TOOL GRINDERS


☐ 7" BENCH SHAPERS

Name _____ Company _____

Street _____ City & State _____

SOUTH BEND

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

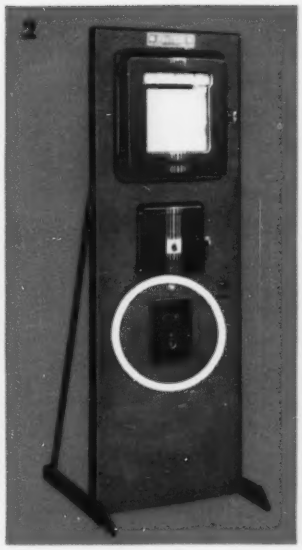
For more information on products advertised, use Inquiry Card, page 247

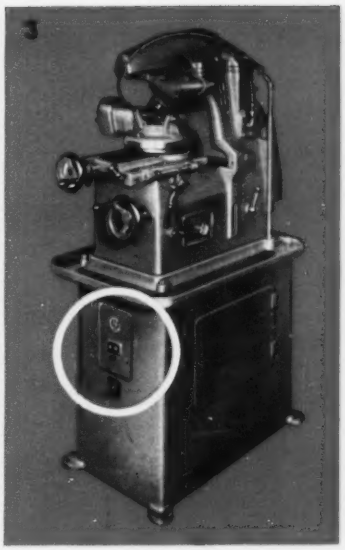
1 Noble & Westbrook shell-marking machine with Bulletin 609 manual flush starter.

2 Leeds&Northrup Micromax Panel with Bulletin 609 manual flush-type starter.

3 Hamilton No.1 gear hobber with Bulletin 709 flush starter in machine base or frame.









When you *design* a new machine

modernize its appearance with flush-type starters

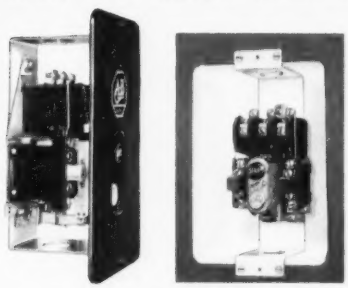
It is a sales asset to any device to have a trim, streamlined appearance . . . and it costs so little if you think of it while your product is still on the drawing board. A good place to start is to include convenient recesses or cavities in your machine frames or pedestals for flush-type Allen-Bradley motor controls.

Allen-Bradley manual and magnetic starters are available in snappy looking faceplates and skeleton mountings, ready to slip into your machine frames. See illustrations above.

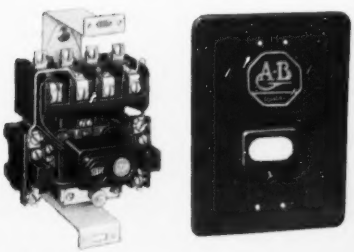
Your nearest Allen-Bradley control engineer will gladly call at your convenience and discuss the flush-type starters best suited to your need. (See illustrations at left.) Allen-Bradley controls are your assurance of trouble free operation and long life.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

FLUSH-TYPE MOTOR STARTERS



Bulletin 609 Size 1 Manual Starters
for flush cavity mountings



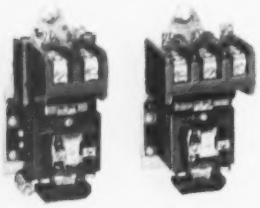
Bulletin 709 Size 1 Solenoid Starters
for flush cavity mountings

1-54-R

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

CONTACTORS

A-C & D-C • Sizes 00 to 7 • Ratings 10 to 900 Amperes

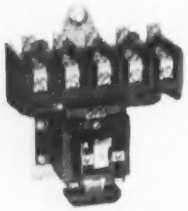


2 pole—Size 1
25 ampere

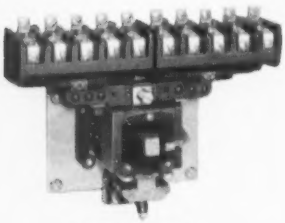
3 pole—Size 1
25 ampere



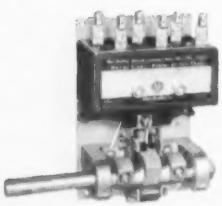
4 pole—Size 1
25 ampere



5 pole—Size 1
25 ampere

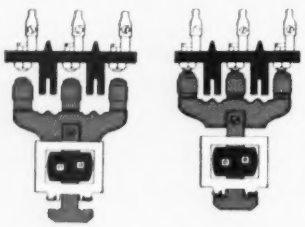


10 pole—Size 1
25 ampere



3 pole—Size 2
50 ampere
cam-operated
contactor

ALL SOLENOID OPERATED

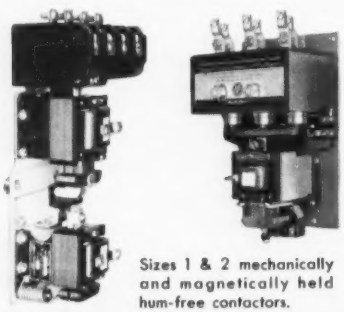


Contacts Open Contacts Closed

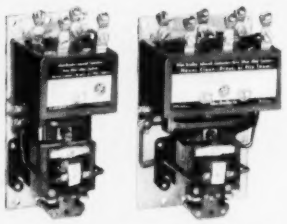
Here is the only complete line of solenoid contactors on the market . . . We have nine sizes from the little Size 00 (10 amperes) to the big Size 7 (900 amperes).

What does this mean to you? It means that all of your contactor requirements . . . from the smallest to the largest . . . can be met with Allen-Bradley trouble free solenoid controls. There is no contact maintenance . . . no pins, pivots, or bearings to stick and give trouble. Just one moving part—the simple solenoid plunger. Operating characteristics are consistent throughout all nine sizes.

Enclosures are available, too, for general purpose, watertight, dust-tight, and explosion-proof service. Allen-Bradley controls are a sales asset to any electrical device. May we send you our latest catalog?

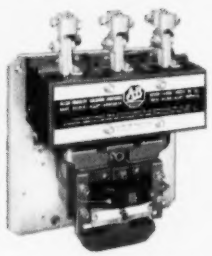


Sizes 1 & 2 mechanically and magnetically held hum-free contactors.

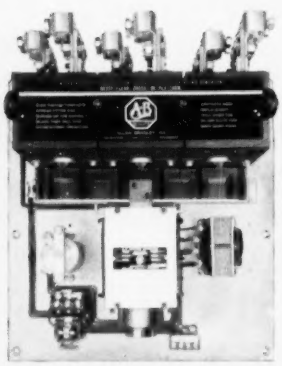


2 pole—Size 2
50 ampere

3 pole—Size 2
50 ampere



3 pole—Sizes 4 & 5
150 & 300 ampere
contactors



3 pole—Sizes 6 & 7
600 & 900 ampere contactors

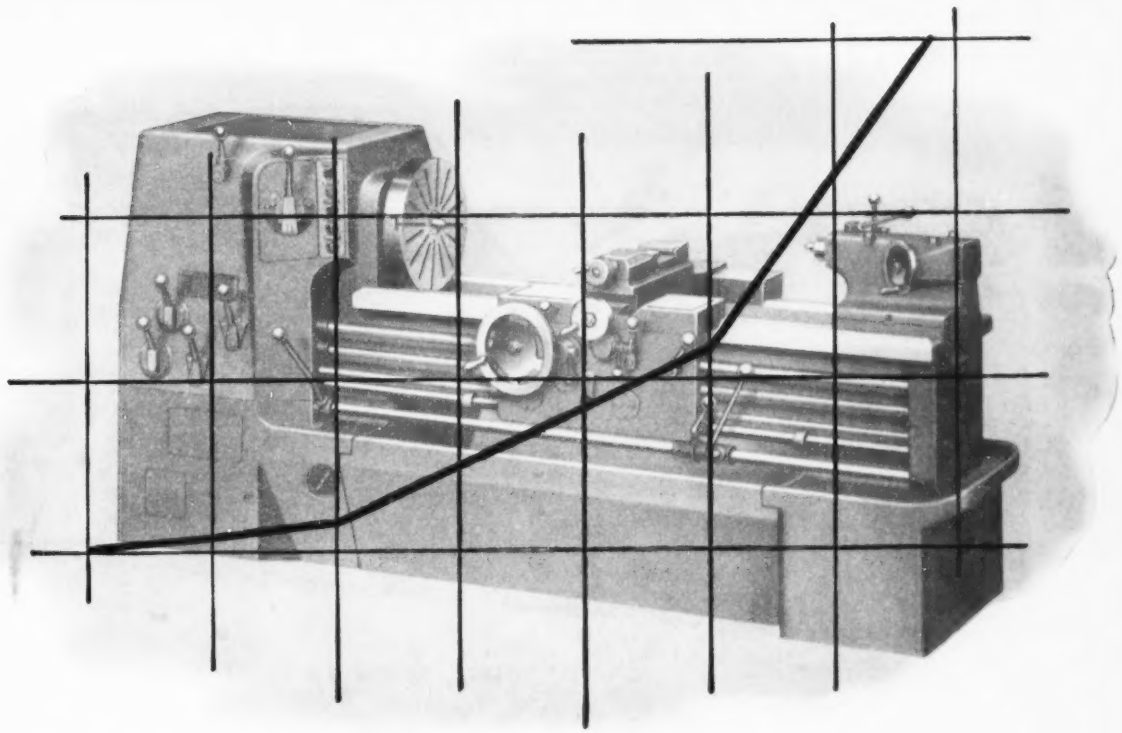
Allen-Bradley Co.
1316 S. Second St.
Milwaukee 4, Wisconsin

A-B Quality

ALLEN-BRADLEY
SOLENOID CONTACTORS
QUALITY

1-54-R

HAVE YOU CHECKED *Your* PRODUCT'S EQ* LATELY?



MAYBE ITS **EFFICIENCY QUOTIENT* NEEDS THE LIFT AETNA ANTI-FRICTION PRODUCTS CAN GIVE

Throughout industry you'll find Aetna precision bearings and parts improving the efficiency and serviceability of today's products and the machines that make them . . . and contributing to the developments of tomorrow.

As a result of Aetna's faculty of solving the sort of anti-friction problems that "couldn't be solved" manufacturers have often realized startling economies or licked tough merchandising problems that stymied sales.

Tell us about YOUR "tough" bearing or parts problems. It's a pretty certain bet that our engineers will be ready with the right answers—at the right prices—for our vast pool of tools and dies, acquired in creating more than 2000 "specials" for industry, usually enables us to meet unique requirements without the expense of new tooling. Just state your problem, send your prints or ask that a nearby representative drop in. No obligation.

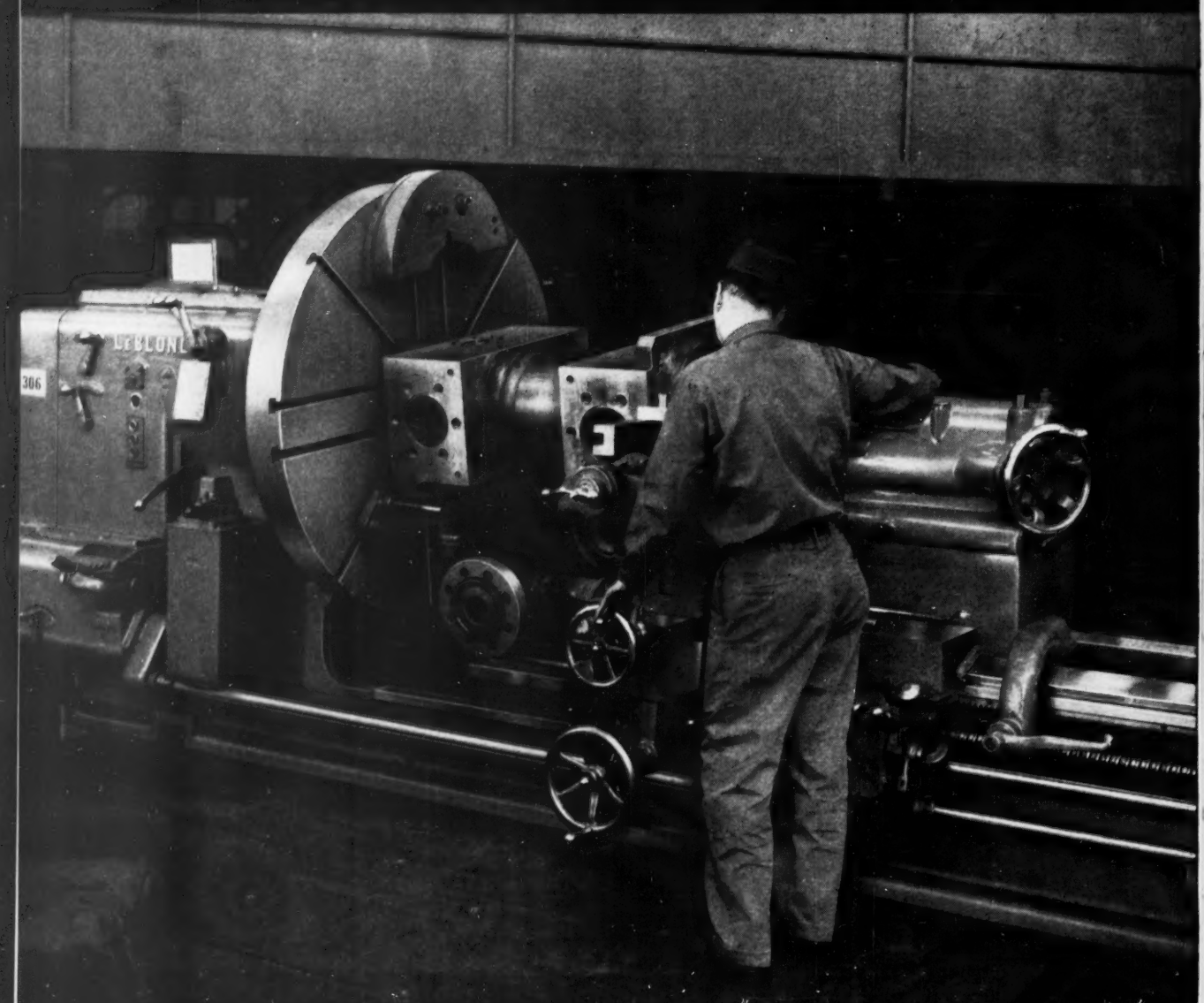


Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings • Miscellaneous Precision Parts.

AETNA BALL AND ROLLER BEARING COMPANY
4600 Schubert Avenue • Chicago 39, Illinois

BRANCH OFFICES COAST-TO-COAST: • Albany • Atlanta • Auburn • Baltimore • Binghamton • Birmingham • Boston • Bridgeport • Buffalo • Charlotte • Chicago • Cincinnati • Cleveland • Denver • Detroit • Hartford • Houston • Jacksonville • Los Angeles • Newark • New York • Niagara Falls • Philadelphia • Pittsburgh • Providence • Richmond • Rochester • San Francisco • Seattle • Syracuse • Trenton • Utica • Waterbury • Worcester. *See your classified 'phone directory for addresses.*

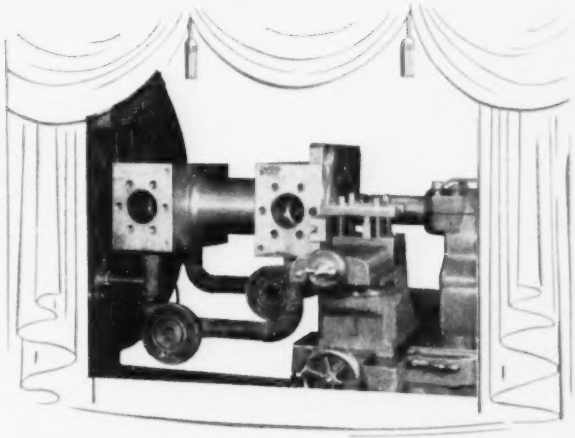
Le Blond Gap Lathe stars in 16-hour Variety



In operation shown, LeBlond 32"/60" Sliding Bed Gap Lathe is used to finish faces of compressor cylinder. Faces must be made parallel, square to bore. Extending manifolds require 78" swing. Job is supported on plug centers, weighs about 3 tons. Spindle speed, 76 rpm; feed, .010"; 2 cuts; job time, approximately 110 minutes.

Show at Clark Brothers

Juggles Diameters From 6" to 78"
... Satisfies Critics
with Stellar Performance!



Clark Brothers Company, Olean, New York, had to "book" a one-lathe act—a single machine to turn out a wide variety of components for "Big-Inch" Type compressors. A special lathe for occasional large-diameter work was too costly.

"Talent scouts" at LeBlond's Buffalo distributor, The Buffalo Machinery Co., recommended their hottest variety number—a LeBlond 32"/60" Sliding Bed Gap Lathe.

Now this versatile machine performs 16-hours-a-day at Clark Brothers, takes the place of at least two machines. One specialty is truing-up and finishing heat-distorted compressor cylinders with manifolds already welded in place—faces must be made parallel. The sliding bed of the LeBlond Gap lathe opens up readily to meet the *78" swing requirement.*

With gap closed, it operates as a standard heavy duty engine lathe, turns power cylinders and cylinder liners *ranging from 6" to 30" diameters, requiring tolerances of ± .0015".*

The multi-purpose LeBlond Sliding Bed Gap Lathe is a sweetheart in the shop. Has adjustable gap and center distance. Four-way rapid traverse. Thirty-six spindle speeds are available, 5 to 500 rpm. Sixty feeds and threads. And, of course, you get all the well-known LeBlond features—hardened and ground steel bed ways, totally enclosed quick-change box, automatic lubrication, one-piece apron, thrust-lock tailstock and many more.

Whether your turning jobs call for versatility or production, heavy hogging or fine finishing, there's a LeBlond Lathe to turn them better, faster. Your LeBlond Distributor will tell you about the three Sliding Bed Gap Lathes, 16"/38", 25"/50", and 32"/60". Call him or write The R. K. LeBlond Machine Tool Company, Cincinnati 8, Ohio.

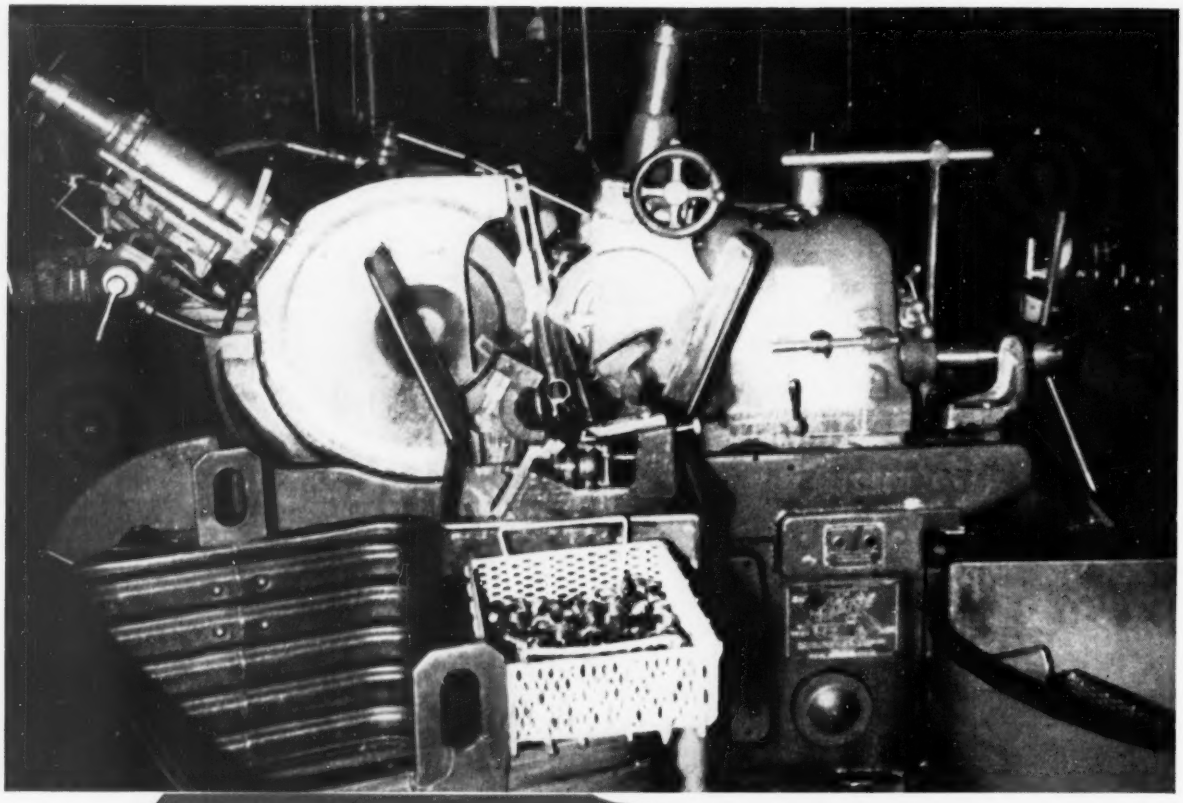
Ask for Bulletin SBG-103D
for more information
on LeBlond Sliding Bed Gap Lathes.

Cut with Confidence

LeBLOND *of Cincinnati*

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 66 YEARS*



How to Assure "NON-STOP" PRODUCTION from hydraulic machines

MAKE YOUR hydraulic medium *Texaco Regal Oil (R&O)* and you'll have no unscheduled stoppages due to sludge, rust or foam. Tests prove that *Texaco Regal Oil (R&O) has more than ten times the oxidation resistance* of ordinary turbine-quality oils – vastly greater ability to prevent sludge, rust and foam.

By eliminating unscheduled stoppages you will, of course, step up your production. *Texaco Regal Oil (R&O)* will also step down your costs. Year in, year out, you'll get smoother operation, longer life for pumps and other parts, longer operating periods between drains and overhauls.

There is a complete line of *Texaco Regal Oils (R&O)* approved by leading hydraulic manufacturers. Let a Texaco Lubrication Engineer help you select the one that will improve your machine performance.

For better, faster, lower cost machining, use *Texaco Cutting, Grinding and Soluble Oils* – a complete line to meet the requirements of every metal and every method of machining.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils (R & O)
FOR ALL HYDRAULIC UNITS

TUNE IN . . . METROPOLITAN OPERA radio broadcasts every Saturday afternoon. See newspaper for time and station.

For more information on products advertised, use Inquiry Card, page 247



By LORING F. OVERMAN

Quick Government Decisions Urged for Machine Tool Industry

SPEAKING as officials who served their stint in the National Production Authority, two top men of the machine tool industry have urged Washington to act quickly in clarifying the outlook for producers of machine tools and heavy production machinery. The spokesmen are Herbert L. Tigges and Swan E. Bergstrom, the new and retiring presidents, respectively, of the National Machine Tool Builders' Association. Both have reason to know how closely the affairs of the machinery industry are linked with Government policies.

At the time the former NPA officials were urging action, the industry was awaiting directives (1) to spell out how machine tools now owned by the Armed Services are to be stored, and under what conditions they may be sold or leased; (2) to fix the conditions under which a mobilization base is to be established and equipped; and (3) to define Washington's viewpoint as to the relationship between the machinery industries and the "Trade, Not Aid" programs.

First, Inventory

Answers to two of the foregoing topics, and possibly the third, were considered dependent upon completion of the Herculean task of making an inventory of the tremendous stock of machinery and machine tools owned by the Armed Services. Several target dates have been set for completing the inventory, with January 10 as the one presently in effect.

Meanwhile, the Department of Defense was following instructions contained in an interim letter issued by Defense Mobilization Director Arthur S. Flemming. The promised directive was expected to coincide with the Flemming instructions—requiring that service-owned tools may not be sold without permission; that machine tool packages may not be broken without permission; and that packages, when no longer needed, will be stored either on or close to the site where they have been used, or else in central government warehouses earmarked for the service and the contractor to which the tools are assigned. A ban against taking such tools for non-defense use was also expected.

$250,000,000 Spending Rules Issued

Anticipating early completion of the production equipment inventory, Charles S. Thomas, Assistant Defense Secretary for Supply and Logistics, has announced the rules under which the Armed Services will be allowed to spend some $250,000,000 authorized by the last Congress for facilities and equipment. The Services were asked to submit requests for approval of expansion projects before December 31.

In general, the reserve plant capacity to be developed will be intended to insure a production rate equaling the general level of requirements during an intermediate mobilization period. It is not the intent of the program, Mr. Thomas points out, to overbuild production capacity.

To quote from the official text: "Specifically, the projects may cover the following types of activity: (1) Construction, modification, rehabilitation, conversion, or acquisition of facilities, including on-site storage facilities. (2) Acquisition of machine tools and production equipment to (a) equip the facilities mentioned in (1); or (b) provide a reserve of machine tools and production equipment needed in the mobilization period to augment available production capacity, to convert existing capacity, or to equip facilities which will be constructed or acquired after mobilization has started."

IN discussing further limitations on specific projects, the official text observes:

"No project shall propose construction of facilities or procurement of machine tools and productive equipment which could be built and installed during the time it would take to activate the facility.

"Projects proposing the acquisition of existing complete facilities (machine tools and production equipment included) should be limited to exceptional cases, such as where the Department of Defense might have to dismantle production lines or move Government production equipment at great expense in order to retain vitally needed production capacity.

"Except in unusual circumstances, projects should not propose procuring machine tools and production equipment to round out a mobilization production line if the complementing tools and equipment assigned to that line have been dispersed.

"Projects for the procurement of machine tools and other production equipment must be related to specific facilities which will be available for the purpose for which the equipment is being produced.

"Funds provided from Reserve Tools and Facilities Program FY-1954 will not be used to procure machine tools or production equipment for current production."

$600,000,000 More in Kitty

In addition to the $250,000,000 fund available under the mobilization base program, $600,000,000 is in the hands of the Armed Services for other probable needs, according to Dr. Arthur S. Flemming. He indicated that the $850,000,000 fund is one part of a three-phase program affecting the machine tool industry. A second phase involves maintenance and leasing of machine tools, and a third to expand the capacity to produce "elephant" tools.

"Trade, Not Aid"?

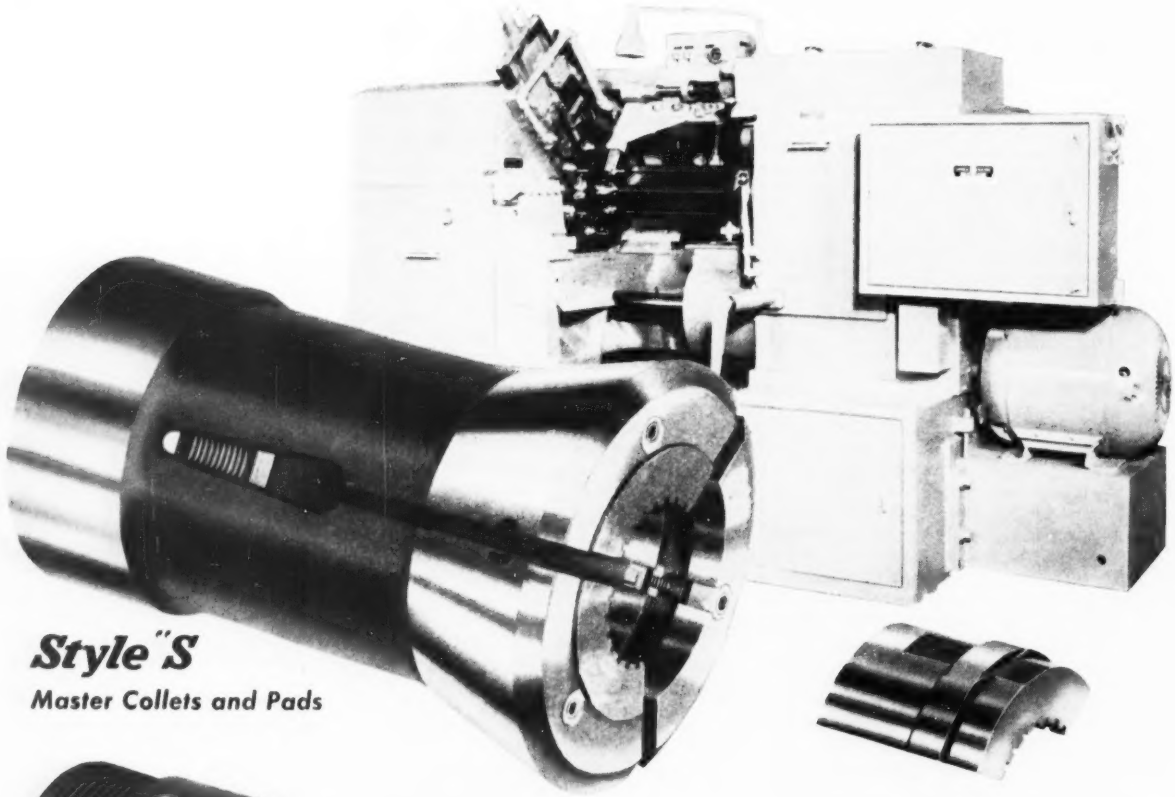
Although conceding that the several Government programs involving machine tools and production equipment are of a helpful nature, spokesmen for the industry appeared concerned over proposals to eliminate import duties. Observed Swan E. Bergstrom, "We do not have any preferential tariff or quotas protecting our industry against the importation of machine tools built in countries with labor rates anywhere from 25 to 50 per cent of ours. And yet there is a movement afoot to reduce the tariff on capital goods, including machine tools, to make it even easier for foreign machine tool builders to compete for our domestic business."

Mr. Bergstrom explained that he would not favor a tariff excluding foreign machinery entirely, but that he felt there should be a levy providing sufficient protection to keep our industry healthy.

HARDINGE
ELMIRA, N.Y.

STANDARD EQUIPMENT
in Progressive Screw Machine Plants

The Only Master With NO Work Pressure On The Screw

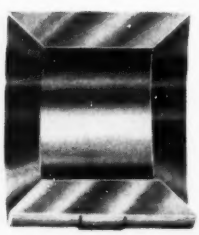


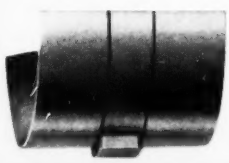
Style "S"
Master Collets and Pads

Pads Interchangeable Among Different Makes of Automatics



Style "B"
Master Feed Fingers and Pads





HARDINGE BROTHERS, INC., ELMIRA, N. Y.

For more information on products advertised, use Inquiry Card, page 247

MACHINERY
JANUARY 1954

New Metal-Working Equipment a Bargain in 1954!

IN these days of high costs it is a rare occasion when purchases can be made at recognized bargain prices. It should, therefore, be gratifying to users of metal-working equipment to learn that the average cost of machinery which they will require for their shops in 1954 is right now only 75 per cent greater than in 1939—fifteen years ago.

This fact has been culled from price data recently compiled by the Bureau of Labor Statistics, which also show that during the same period of time construction costs rose 190 per cent; and the prices of non-ferrous metals, 131 per cent, and of iron and steel, 111 per cent. The average increase in the cost of all industrial commodities was 98 per cent. It is especially interesting to note that the increases in the prices of most items of machinery and equipment have been relatively modest since early 1951, even though price controls were lifted more than six months ago.

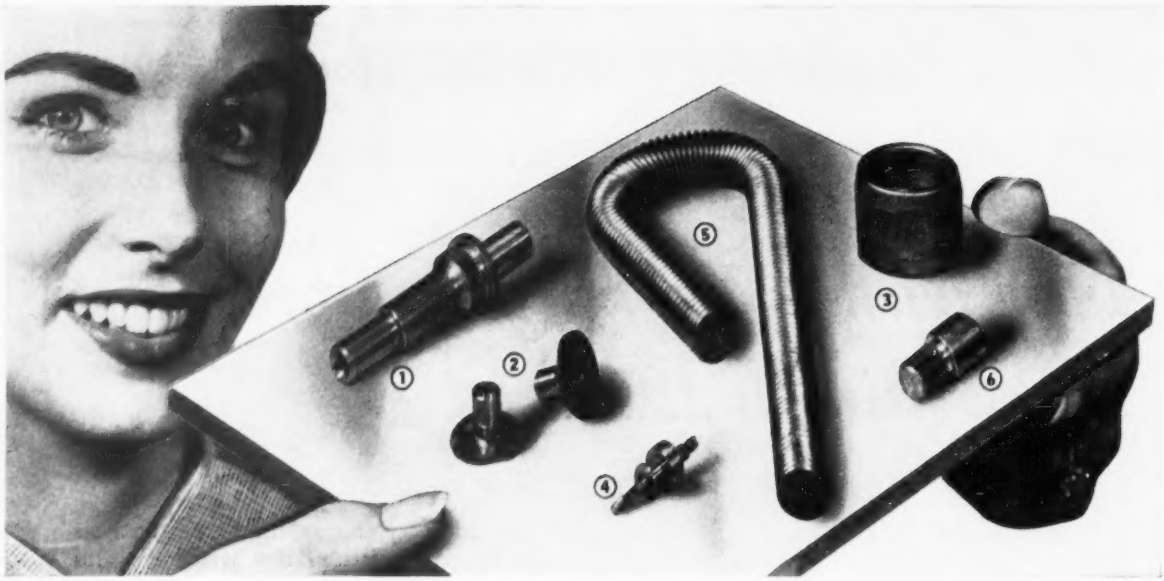
Despite the comparatively moderate increases in the cost of metal-working equipment, the wage increases granted workers by the machinery and equipment companies amounted to 157 per cent. The fact that increased wages have not been more fully reflected in today's prices undoubtedly is the result of a parallel rise in the productivity of this industry, according to an analysis made by economists of the Machinery and Allied Products Institute. On the whole, the manufacturing plants are modern and plant capacity is efficiently utilized. Labor is effectively deployed and labor relations are generally good. Apparently a large proportion of the benefits derived from efficient operation of the industry has been passed on to the consumers as well as to the workers.

Only the forces at work in a competitive market could have produced the phenomenon of a price structure in the machinery and equipment industry that is low in proportion to labor costs and to the costs of raw materials and services purchased from other industries. Furthermore—and this is not revealed in the price index—the 1954 machine costs 75 per cent more than its 1939 predecessor, but it is not the same machine. In performance, precision, and durability, today's machine is easily twice as good as the average machine of the same type built fifteen years ago.

The buyer of metal-working equipment today gets a bargain, from both the standpoint of original purchase price and the potentialities of the new equipment for turning out products of higher quality at prices that are attractive to a wider market.

Charles O. Herb

EDITOR



Lead Lubricating Steel

increases production 43%

It is almost too good to be true—but, in Ledloy, lead actually lubricates the steel during machining, permitting greatly increased feeds and speeds. On job after job in shops throughout the country Ledloy is effecting net savings of 25% or more because it machines 30% to 50% faster than B-1113 and extends tool life as much as 200%.

The lead in this remarkable open hearth steel is so finely dispersed it cannot be seen with a microscope. Yet it reduces the friction between chip and cutting tool substantially. And Ledloy machines to an unusually clean smooth finish—case hardens effectively—bends, crimps, swedges or rivets easily.

Your nearby Ryerson plant now has large stocks of Ledloy rounds, squares and hexagons in a wide range of sizes. So get all the facts from your Ryerson representative or write for engineering data on Ledloy. And call Ryerson for quick shipment of this remarkable new free-machining steel.

How Ledloy Cut Costs on These Parts

1. ***BEATER SHAFT**—production increased 43% when shop switched to Ledloy from C-1117. Part is case hardened to 60-62 Rockwell C.
2. ***GOLF SHOE LUGS**—Ledloy succeeded where free-cutting Bessemer steels failed in this swedging operation. Took inside threads perfectly.
3. ***UNIVERSAL JOINT SOCKET**—formerly made from C-1117, production rose 72% with Ledloy. Part is case hardened to 60-62 Rockwell C.
4. ***DRIVE SHAFT**—result of changing from B-1113 to Ledloy: production increased more than 35%, over-all costs decreased 20%.
5. ***THREADED BAR**—the excellent cold-bending properties of Ledloy important here. Notice clear definition of thread and fine finish.
6. ***KNURLED STUD**—B-1113 originally used. Use of Ledloy resulted in 19.9% reduction in over-all costs, 54% increased in production.

*Company name and more detailed figures on request.

Principal Products: Carbon, Alloy & Stainless Steels—Bars, Structurals, Plates, Sheets, Tubing, Machinery & Tools, Etc.

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT
PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

For more information on products advertised, use Inquiry Card, page 247

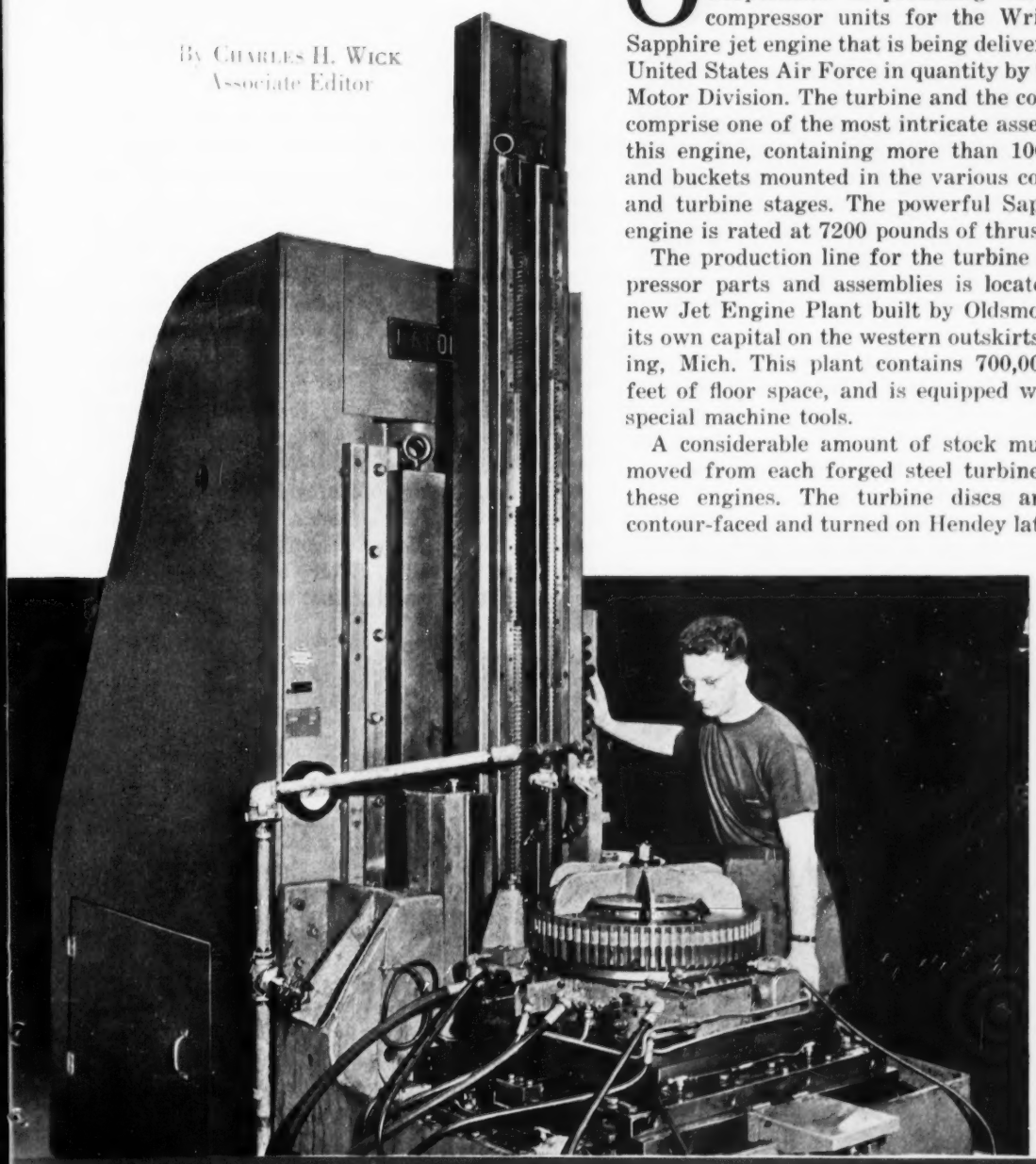
Machining Turbine and Compressor Parts for Sapphire Jet Engines

By Charles H. Wick
Associate Editor

OLDSMOBILE Division of General Motors Corporation is producing turbine and compressor units for the Wright J-65 Sapphire jet engine that is being delivered to the United States Air Force in quantity by the Buick Motor Division. The turbine and the compressor comprise one of the most intricate assemblies in this engine, containing more than 1000 blades and buckets mounted in the various compressor and turbine stages. The powerful Sapphire jet engine is rated at 7200 pounds of thrust.

The production line for the turbine and compressor parts and assemblies is located in the new Jet Engine Plant built by Oldsmobile with its own capital on the western outskirts of Lansing, Mich. This plant contains 700,000 square feet of floor space, and is equipped with many special machine tools.

A considerable amount of stock must be removed from each forged steel turbine disc for these engines. The turbine discs are finish-contour-faced and turned on Hendey lathes, such



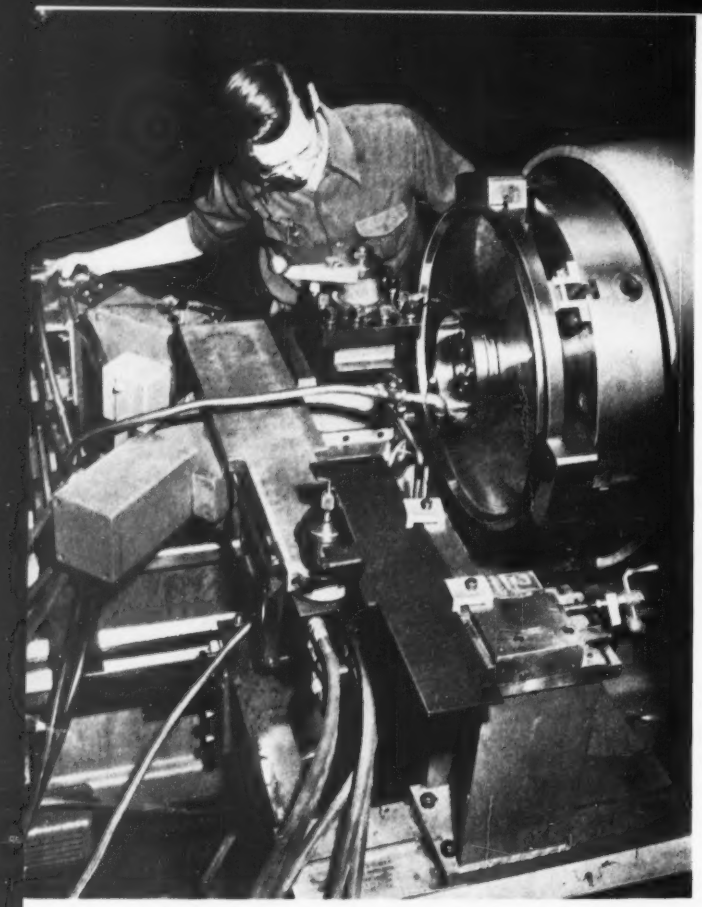


Fig. 1. Lathe equipped with hydraulic duplicating attachment and variable-speed drive for finish-contour-facing and turning turbine discs

as the one shown in Fig. 1, that are equipped with Turchan hydraulic duplicating attachments and Reliance adjustable speed drives. In this operation, the cutting speed is maintained constant by automatically varying the rotational speed of the turbine disc.

The contour cutting tool is hydraulically controlled through the desired path by means of a flat steel template, with the tool-slide operating at a 45-degree angle to the work-piece. A tracer stylus, in contact with the template, allows metered amounts of oil from a tracer valve to enter a hydraulic cylinder attached to the tool-slide, thus controlling the movement of the cutting tool.

Fir-tree serrations for holding the turbine buckets are cut in the peripheries of the turbine discs on Lapointe 15-ton, 78-inch stroke, vertical broaching machines such as the one seen in the heading illustration. The broaching machines are tooled with two rows of broach inserts, one for roughing and the other for finishing the serrations, and an automatic indexing fixture that is tilted at an angle of 26 degrees.

Extremely close dimensional accuracies must be maintained in machining the turbine disc serrations. To insure such accuracy, a test block (or coupon) approximately 2 inches square and 1 inch thick, and of the same material and hardness as the turbine disc, is broached first. Then the contour of the broached serration in the coupon is inspected by means of an optical comparator. If the coupon is satisfactory, a turbine disc is placed on a serrated base-plate in the fixture, locating from the previously turned flange and by means of dowels. A serrated cover plate is then clamped over the work-piece, and the broaching cycle is begun.

Automatic rotary indexing is accomplished by means of a hydraulic cylinder, limit switches preventing the ram from descending until the disc has been indexed. After completely rough-broaching all the serrations, the fixture is moved

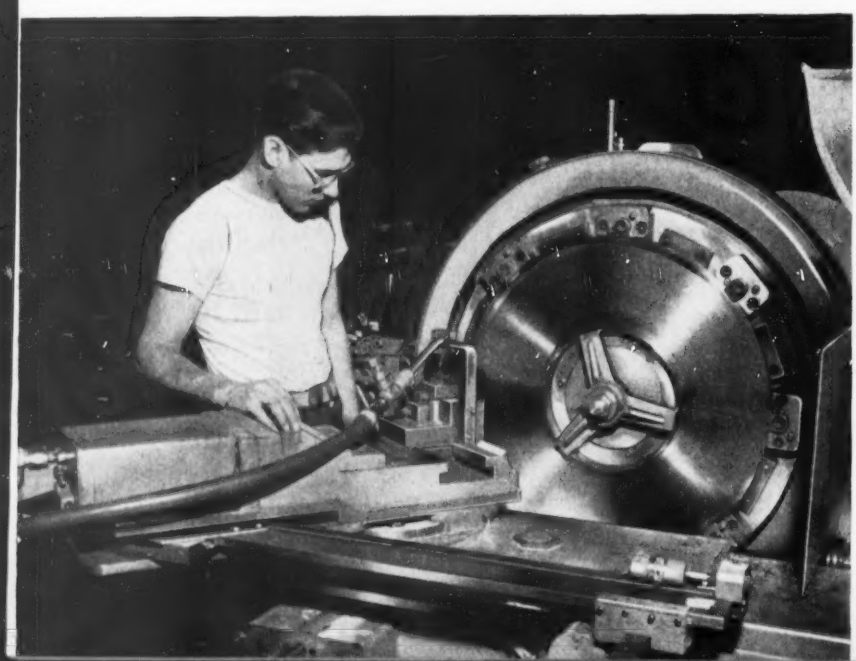


Fig. 2. Forged steel compressor discs are contour-faced on automatic lathes provided with hydraulic profiling attachments and variable-speed drives.



Fig. 3. For accurate location of compressor discs during coutour-facing, their hub and flange faces are qualified on rotary surface grinding machines.

sidewise on the machine bed to align it with the finishing broaches.

Forged steel compressor discs are contour-faced on LeBlond automatic lathes such as the one shown in Fig. 2. These lathes are equipped with simple "Hydra-Trace" profiling attachments, mounted on the cross-slide and having a stylus that follows the contour of a flat template to hydraulically control the path of a carbide cutting tool. The complete machining cycle, including tool retraction and rapid traverse, is automatic. These automatic contour-facing lathes are also equipped with Reliance adjustable speed drives that maintain a constant cutting speed.

To accurately locate the compressor discs for the various contour-facing operations and subsequent machining, it is necessary to grind the center hub and peripheral flange faces after rough-, semi-finish-, and finish-profiling. These qualifying operations are performed on Arter rotary surface grinding machines, Fig. 3. In all of the contour-facing and grinding operations, the thickness of the flange is reduced from 1/2 inch (in the forging) to about 1/64 inch.

The rotary surface grinders are equipped with vitrified-bond, aluminum-oxide abrasive wheels mounted on slides that are moved hydraulically. Automatic reversal of the wheel-slide is controlled by adjustable dogs. The compressor discs are held by means of magnetic chucks.

Serrations are ground in the hubs of the compressor discs on the Thompson Truforming machine seen in Fig. 4. The multiple-form grinding wheel used for this operation is crush-dressed to the required contour by a hardened steel roll that is rotated against the wheel at reduced speed.



Fig. 4. Crush-dressed, multiple-form grinding wheel is employed to form serrations in the hubs of compressor discs. Seven serrations are ground per pass.

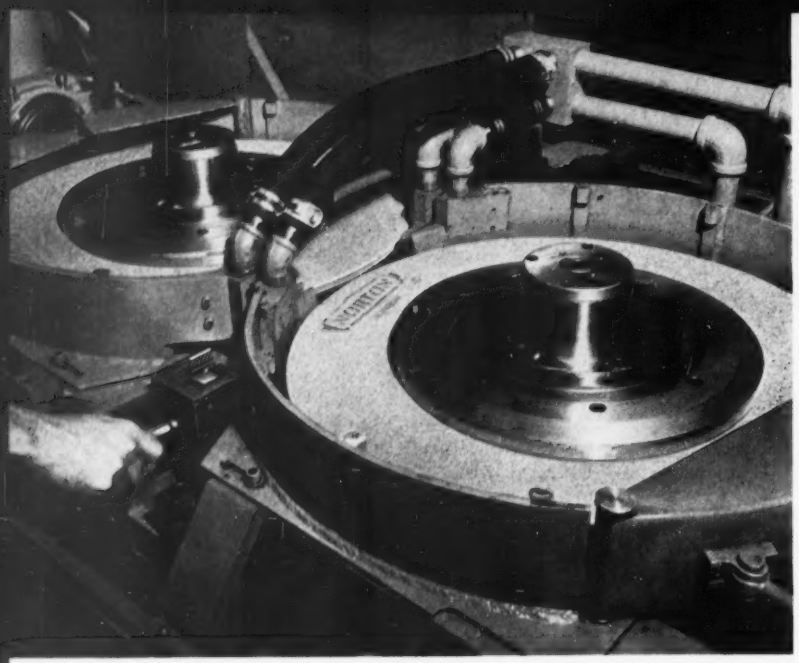


Fig. 5. Fir-tree serrations are ground in the foot of forged turbine buckets between two diamond-dressed wheels on this precision grinding machine.

With every pass of the work-piece beneath the multiple-form wheel, one serration is finished and six more are rough-ground.

Fir-tree serrations are ground in the foot of each turbine bucket between two diamond-dressed wheels on the Ex-Cell-O precision form grinding machine shown in Fig. 5. (In this illustration, covers have been removed to show the grinding wheels.) Each bucket is mounted in an individual block type fixture, locating from the forged airfoil surfaces.

In a completely automatic cycle, the loaded fixture is hydraulically moved to the two horizontal grinding wheels, and is reciprocated between them for a pre-set number of strokes, thus simultaneously forming fir-tree serrations on both sides of the bucket foot. After each stroke, the wheels are fed toward each other, until the finished work size has been reached. Then the slide returns to the front of the machine.

Vitrified-bonded, aluminum-oxide abrasive wheels are employed for this operation. Each wheel is dressed independently (but simultaneously) by wedge-shaped diamonds that are automatically moved vertically by means of lead-screws, and toward or away from the wheels by horizontal cams. The serrated sections of the turbine buckets are rough-milled and then finish-ground in about eight passes.

Concave and convex airfoil surfaces, blending edges and fillets, and the top of the shelf on the turbine buckets are rough-milled on Pratt & Whitney eight-spindle copy-milling machines such as the one shown in Fig. 6. The machines are each equipped with two tracer units, one at the top and the other at the bottom of a hinged vertical member that carries the eight cutterheads. The tracer spindles are hydraulically held in contact with steel master form-blocks.

Two vertical rows of work-holding fixtures, each containing eight fixtures, are provided on the copy-milling machine, and are arranged for indexing through 180 degrees. This enables eight turbine bucket forgings to be milled while the other eight fixtures are being unloaded and reloaded, and one operator can attend two ma-

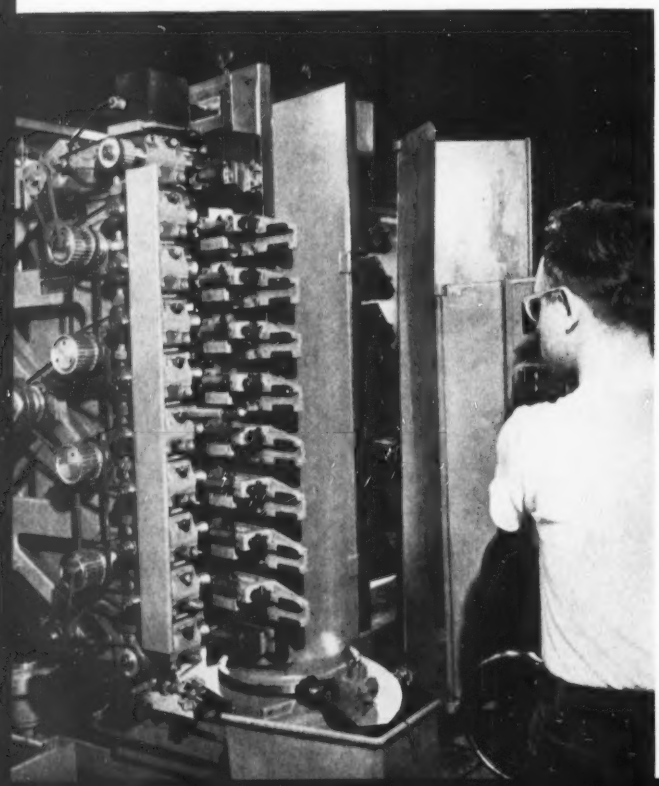


Fig. 6. Eight-spindle copying machine for rough-milling concave and convex airfoil surfaces of turbine buckets. Masters are located at top and bottom.

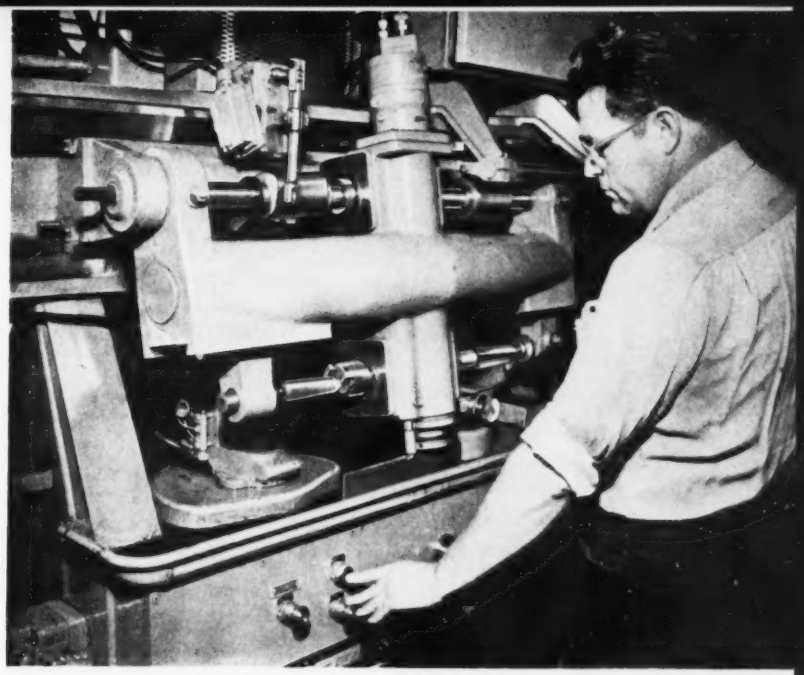


Fig. 7. Automatic profile, belt-grinding machine for finishing airfoil surfaces of turbine buckets. Work-piece is at lower left and master at right.

chines. The buckets are held in the fixtures by their previously ground serrations and centers in the bosses at their airfoil ends. The spindles are equipped with special ball-nosed carbide cutters.

Concave airfoil surfaces of the turbine bucket forgings are milled first. Then, the buckets are repositioned in the fixtures and their convex surfaces are machined. Milling is started at the upper edge and boss end of the buckets. The hinged member carrying the cutter-heads and tracing spindles is hydraulically fed downward.

When the cutters reach the lower edges of the buckets, they are automatically fed toward the serrated ends of the buckets. Then the cutters are fed upward and horizontally, repeating this rectangular path until the passes required to traverse the airfoil surfaces have been completed. It is important that the cutters be kept in the work during the entire machining cycle, because of its work-hardening properties.

Milled airfoil surfaces on the turbine buckets are ground on special Pratt & Whitney automatic profile, belt grinding machines such as the one shown in Fig. 7. Leading and trailing edges, and areas close to the top shelf—as well as both the concave and convex airfoil surfaces of the turbine buckets—are rough-ground in one machine and finished in another, in completely automatic cycles. One operator can tend a battery of machines, since he only has to unload finished parts and replace them with milled buckets. The buckets are located in a work-holding adapter, gripping them by the serrations and centers.

The automatic airfoil grinding machines operate on the duplicating principle, copying from a master having the required shape. A pivoting work frame is suspended from a traversing carriage at the top of the airfoil grinding machine. The grinding belt unit and master follower roll are carried on a center horizontal beam. As the work (seen at the lower left) and master (lower right) rotate simultaneously, the master moves the work frame in and out, thus causing the grinding contact wheel to duplicate the shape.

At the same time, the master actuates a velocity cam (upper left) and wave cam (upper right). The velocity cam automatically varies the rotary speed of the work so that the leading and trailing edges pass the abrasive belt faster than the concave and convex surfaces. The wave cam swivels the grinding contact wheel so that the surface of the abrasive belt is always normal to the work surface. As the turbine bucket is rotated, it is traversed lengthwise across the abrasive belt. When the blending fillets between the top shelf and airfoil surfaces are being ground, the contact wheel is given a compound motion by means of yet another cam.

Tangs on the root ends of forged steel compressor blades for the Sapphire jet engine are rough-formed by broaching, and then finished on Gallmeyer & Livingston surface grinding machines, such as the one shown in Fig. 8. In the operation illustrated—grinding the sides of the tangs—six compressor blades are mounted at a time in a special angularly mounted fixture on the reciprocating table of the machine.

Bosses that contain the centers required for support in previous machining are cut from the steel compressor blades on the DoAll friction sawing machine shown in Fig. 9. The machine is equipped with a special circle-cutting fixture mounted on a pedestal. Neoprene pads, which match the contour of the airfoil surfaces of the blades, are cemented to the fixture baseplate so that they support the blades as close to the cut-

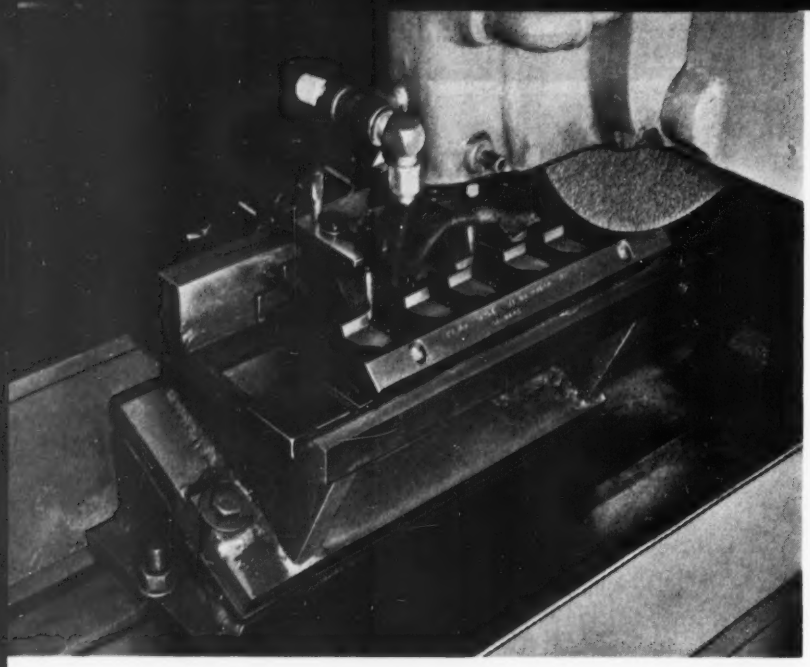


Fig. 8. Special fixture mounted at an angle on the reciprocating table of surface grinding machine for finishing tang surfaces of compressor blades

ting point as possible. The blades to be sawed are slipped into mating fir-tree serrations in a production compressor disc that is mounted inside the fixture. A Neoprene-faced steel cover ring, set on an angle, holds the blade being sawed.

The fixture rotates continuously, being driven by a separate electric motor equipped with a variable speed unit. Blades for any of the compressor stages can be handled on the same machine simply by changing the disc and adjusting the fixture.

Forged aluminum-alloy compressor blades are qualified by milling and center drilling on the unique four-cutter machine shown in Fig. 10. This machine, designed by Oldsmobile and built by Impco (Industrial Metal Products Corporation, Lansing, Mich.), has been equipped with a Brown & Sharpe electronic gage having six probes that contact the concave airfoil surface of the blade after the blade has been hydraulically clamped in a trunnion fixture.

While clamped in the fixture, the blade can be swiveled from side to side about its center of gravity, or raised or lowered endwise. Also, the fixture itself can be raised or lowered. The electronic probes, having previously been set up from a master having a ground airfoil surface, will indicate on the gage dial which end of the unmachined blade is high, where the forging is thick, or whether the blade is twisted. Then, the blade and fixture are adjusted to correct the setting as close to the master as possible.

After correct positioning of the blade, the machine mills a locating surface on one side of its shelf, and two locating V-grooves, one on each edge of the tang. Also, the boss on the airfoil end

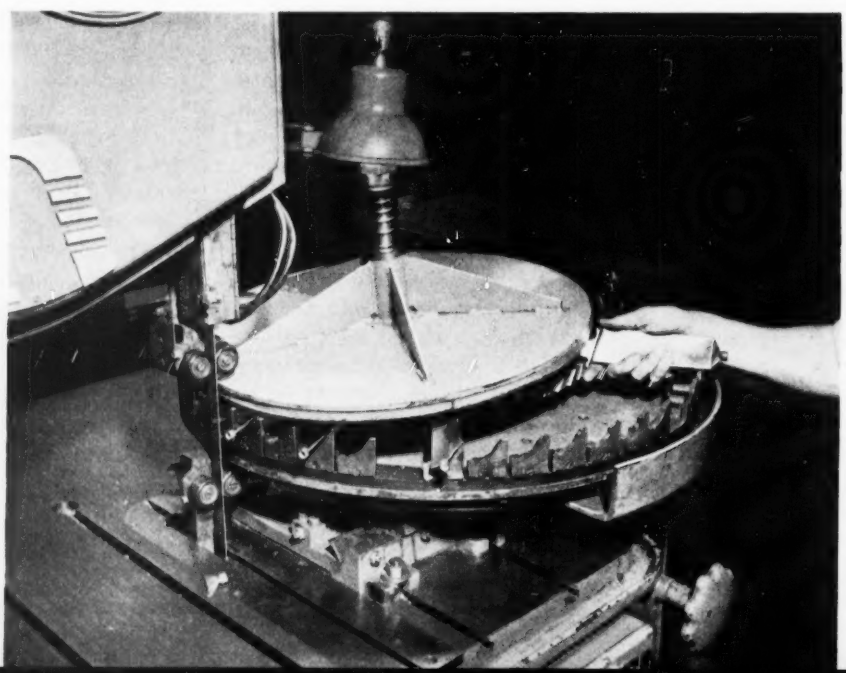


Fig. 9. Friction sawing machine equipped with a special rotary fixture for cutting bosses from end of forged steel compressor blades

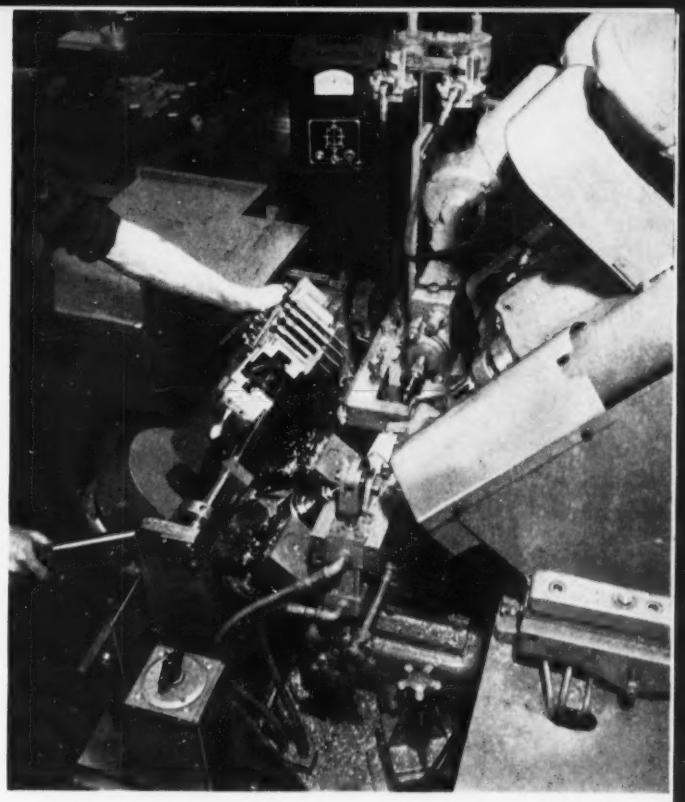


Fig. 10. Unique qualifying machine employs six probes of an electronic gaging unit for positioning compressor blade prior to center drilling and milling.

of the blade is center drilled. These surfaces serve as accurate locating points.

Compressor shafts for these jet engines are machined from aluminum-alloy forgings. A total of seventy-four surfaces having different diameters must be machined on each shaft, and thirty-two of these surfaces must be held to close tolerances, since they serve as seats for fitting the compressor discs, shroud rings, and other parts.

Contour-turning and boring of forged aluminum compressor shafts are performed on New Britain-Fischer hydraulic copying lathes such as the ones shown in Figs. 11 and 12. The copying attachment is in a vertical plane with the center line of the work, with a flat template on the front of the machine, near the bottom. The forging is held on an air-operated diaphragm arbor.

The sequence of operations performed on the compressor shaft consists of first rough-step-turning the outside halfway from the small diameter end, rough-step-turning the other half, rough-boring the inside contour part way, rough-boring the inside contour the rest of the way, semi-finish-turning the outside diameters, finish-boring, and finally, finish-turning. No coolant is required in turning, since the heat is conducted away with the hot chips. However, a coolant is necessary in boring to prevent distortion.

Compressor blades are secured to the discs in the Sapphire jet engine by means of rivets. Holes for the rivets are drilled and reamed through the tangs and the disc flanges on special Cross drilling machines such as the one shown in Fig. 14. A total of twenty-eight of these double-end, trunnion type machines are employed. Thirteen of the machines are multiple-purpose, having sixteen spindles on each end of the machine, and can handle certain compressor stages. The remaining fifteen are single-purpose machines having three spindles on each end, for drilling and reaming other compressor stages.

Adjacent to each machine is a loading bench on which the special work-holding fixture is mounted, Fig. 13. The bottom and top compressor discs for one stage and a blade locator are placed in the fixture, and the blades are loaded into position between the discs—being held on their outside diameters by spring-loaded centers, and on their inside diameters by the locator. Also, shims are placed between the two compressor discs. After the blade locator is removed, a concentricity device, a bushing plate, and a clamping plate are successively loaded into the fixture. The clamping plate is secured by tightening three nuts. A lifting device is attached to the loaded fixture, weighing about 2500 pounds, and the fixture is moved, by an overhead crane, to the drilling machine. Tool boards are provided for storing the locators, bushing plates, and tools.

On the single-purpose machines, three holes are drilled simultaneously from each end, through the flanges of the two steel compressor discs and tangs of the blades. After the fixture has been indexed through one-third of a revolution, all rivet holes in the compressor stage have been drilled. Upon completing the second third of a revolution, all holes are end-cut reamed. Then, in the final third of a revolution indexing, the holes are finish-reamed.

On the multiple-purpose machines, only two holes are drilled from each end at the same time, and the fixtures are indexed through one and one-half revolutions to complete the drilling and reaming of all holes.

The cutting tools are changed after every one-third revolution on the single-purpose machines, and after every one-half revolution on the multiple-purpose machines. It is unnecessary to change the bushings since fast-spiral step-diameter drills are employed. The large-diameter surfaces of these drills pilot on the reamer bushing bores. The fast-spiral drills pull the chips out of the holes rapidly, thus preventing them from curling up in the flutes of the tools. Four passes are made with each tool to complete the drilling.

All of the fixtures and spindles on the various machines are painted in accordance with a color

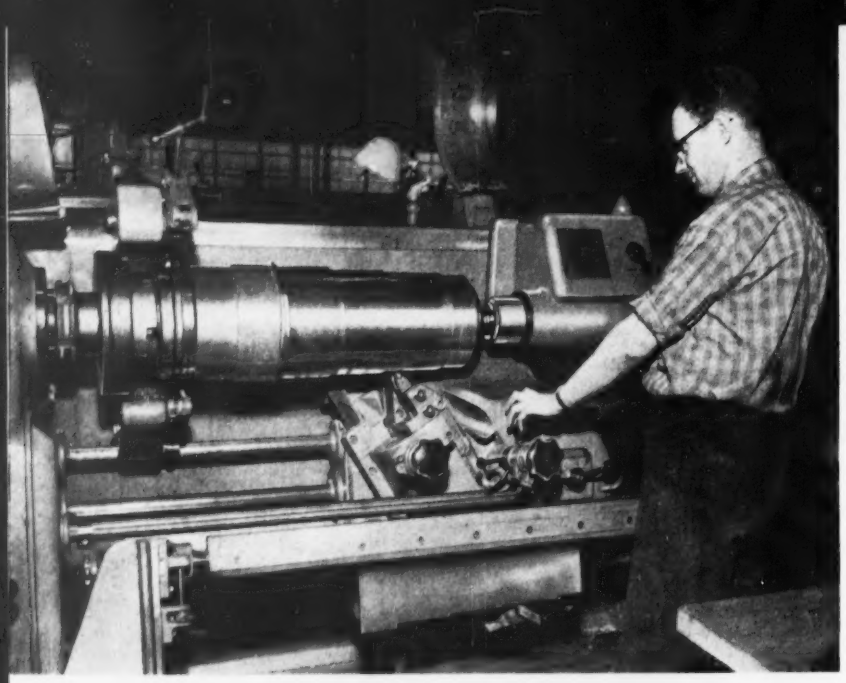


Fig. 11. A total of seventy-four surfaces having different diameters are turned on aluminum compressor shaft by means of this hydraulic copying lathe.

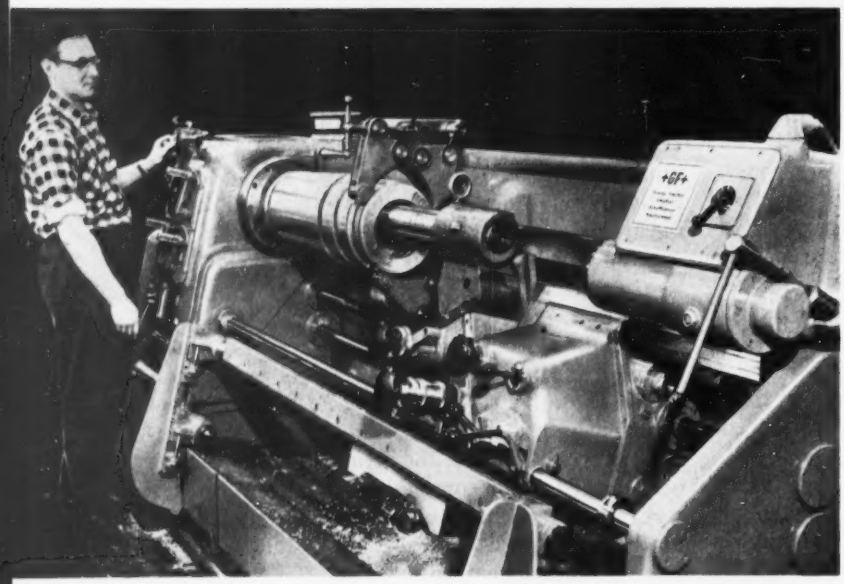


Fig. 12. Another hydraulic copying lathe for contour-boring the forged aluminum compressor shaft. Tracing master is at bottom of lathe.

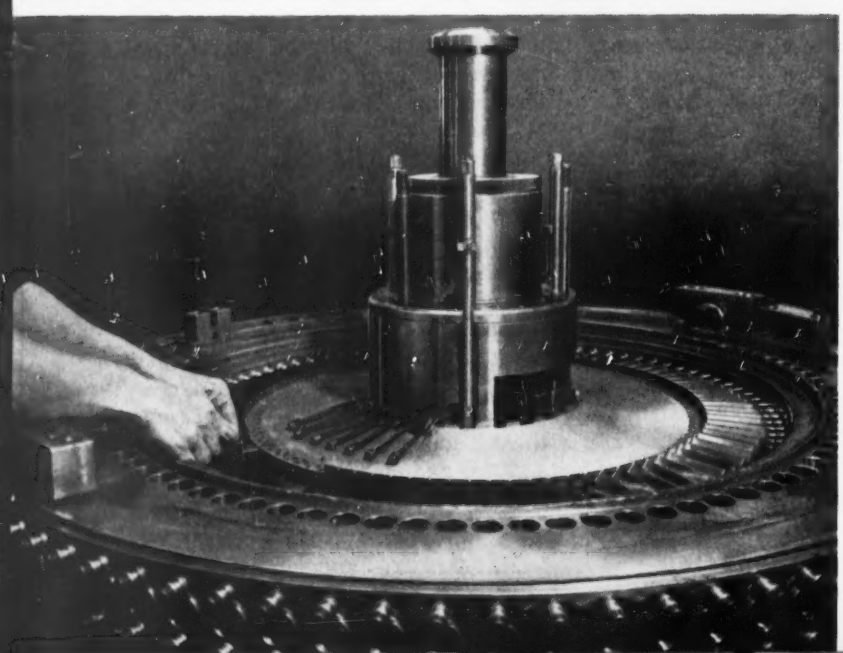


Fig. 13. Compressor blades, the tangs of which have been drilled and reamed, are here shown being removed from the special work-holding fixture.

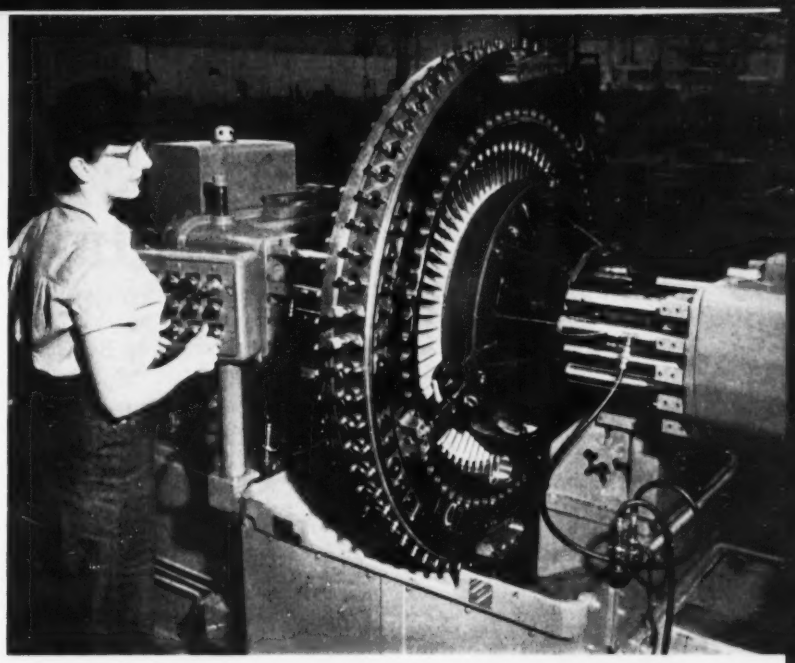


Fig. 14. Rivet holes are drilled and reamed through the compressor blade tangs and disc flanges on special double-end, trunnion type machines.

code to identify the ones used for a particular compressor stage. All spindles are rotated at a fixed cutting speed for both drilling and reaming. The feed rate is changed, however, by means of a Vickers hydraulic flow control valve, when changing from drilling to reaming, and also when machining different compressor stages. The tools are oil-mist lubricated and cooled.

After drilling and reaming the rivet holes, the loaded fixture is lifted from the machine by an overhead crane and returned to the loading bench. There, the lifting device, nuts, clamping plate, bushing plate, and concentricity device are removed from the fixture. The spring-loaded pins holding the outside diameters of the blades can all be retracted at once, hydraulically, or one by one manually. The compressor blades are numbered for identification as they are removed from the assembly, so that they can be put back in the same place.

After reassembling and riveting, peripheries of the compressor blades are ground to the required diameter on the Van Norman cylindrical grinding machine shown in Fig. 15. An arbor is provided with different sleeves to accommodate compressor assemblies for various stages.

Both heating and cooling are employed to join the shaft to the turbine and compressor stage assemblies. The shaft is placed in a refrigerating unit. Meanwhile, the turbine and compressor stages are arranged in a special hydraulic assembly machine, and the discs are heated by infra-red lamps. The cold shrunken shaft is placed in the machine and the expanded discs are pushed over it. When the assembly returns to room temperature, a tight fit is insured.

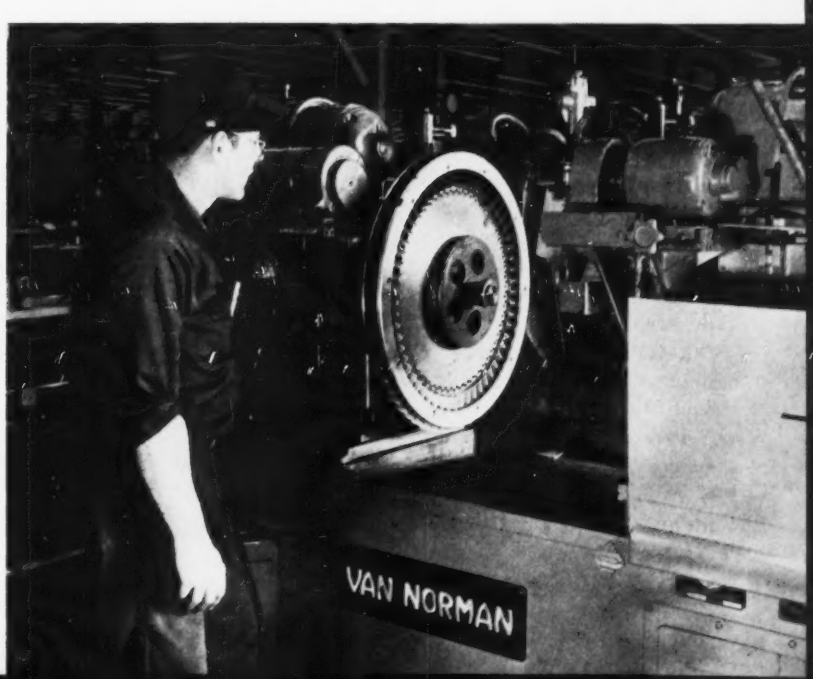
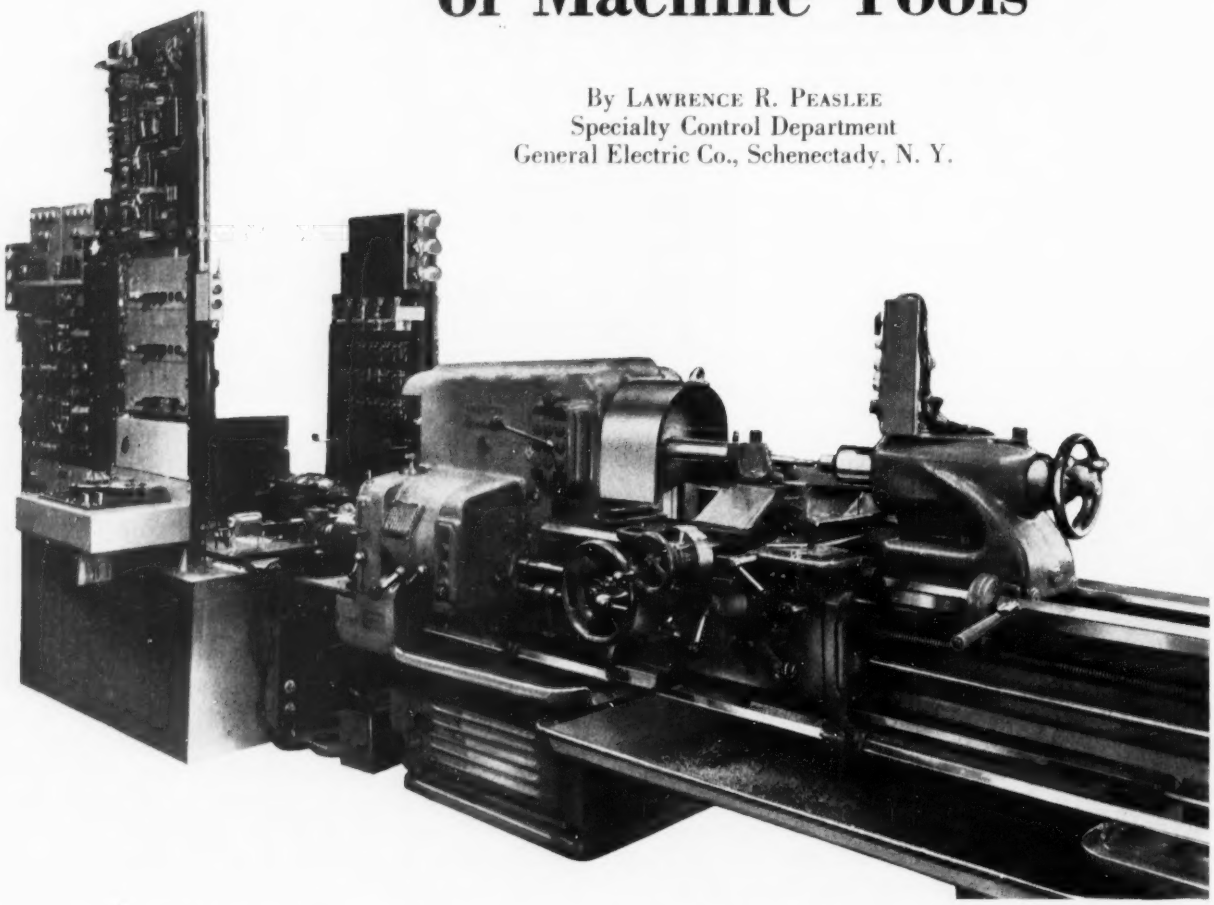


Fig. 15. Cylindrical grinding machine employed to grind the peripheries of the compressor blades after they have been reassembled and riveted.

Magnetic Tape Programming of Machine Tools

By Lawrence R. Peaslee
Specialty Control Department
General Electric Co., Schenectady, N. Y.



MAGNETIC tape recorders have been reproducing symphonies in sound for many years; now they are also reproducing symphonies in motion. The tape passing through the recorder sets up, or "programs," the signals necessary to control all of the moving members of a machine tool throughout its operating cycle.

This new system of control was first demonstrated by the General Electric Co. in 1947. In reality, it imparts the faculty of memory to the conventional machine tool. "Record-Playback Control," the name given to the system, is self-descriptive: The machine movements in making the initial work-piece are recorded on the magnetic tape, then played back when making each duplicate work-piece.

Programs recorded on tape have already been successfully used to control an engine lathe and a milling machine. Now General Electric is manufacturing coordinated drives and a control for the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. The control will automatically program all of the motions of an aircraft skin-milling machine throughout operating cycles up to several hours duration.

Principle of Record-Playback Control

While the machine is making the initial work-piece, signals are obtained from selsyns (synchros) geared to the various moving members. These signals are recorded on a magnetic tape. During the playback, the tape passes over pick-up heads that reproduce the signals. After amplification, these signals are compared with signals from the selsyns geared to the machine. Electronic and amplidyne servomechanism controls then drive the moving members in synchronization with the tape signals. Smooth, stepless reproductions of the recorded movements are executed by the machine.

To adapt a machine to Record-Playback Control, each feed or movement is individually motorized and equipped with a selsyn. A separate channel on the tape recorder is required for each feed or movement to be controlled. Other channels can be utilized for turning auxiliary equipment on and off during the operating cycle. As many as five intermittent functions can be superimposed on one recorder channel.

A diagram representing a typical application to a machine tool is shown in Fig. 1. The coordinate feeds *X* and *Y* for either the work-table or the tool-slide are motorized and have selsyns attached. Amplidynes supply adjustable voltage to the motors. The recorder has one channel for feed *X* and one for feed *Y*. It also has a third channel *Z* which energizes and de-energizes motors for the oil-pump, coolant pump, and spindle at the proper moments in the operating cycle of the machine.

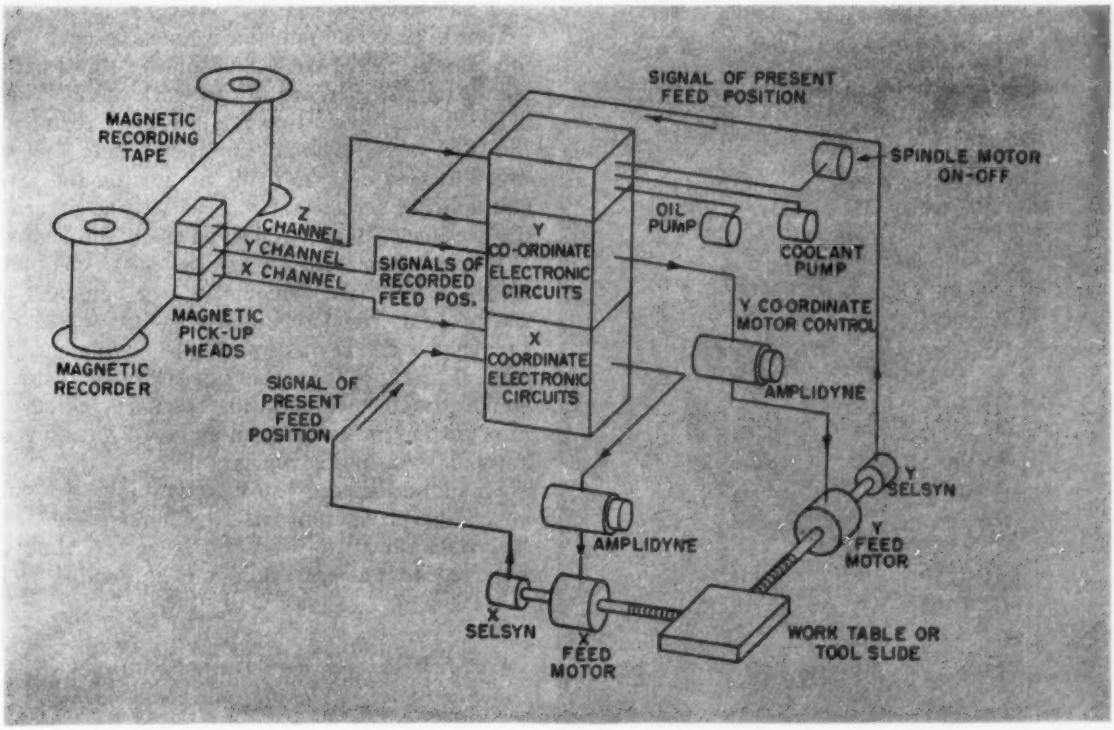
The 16-inch American Pacemaker engine lathe seen in the heading illustration was the first machine adapted to Record-Playback Control. Carriage and cross-slide feeds were individually motorized to permit programming. Turning the various diameters of the four identical shafts shown in Fig. 2 is typical of the work that is produced on this lathe. It is merely necessary to select the appropriate reel of tape, Fig. 3, place it in the recorder, set up the work-piece and cutter, and press the start button.

When the first end of the shaft is roughed and finished, the cutter automatically returns to its starting point, and the feeds, spindle, and recorder automatically stop. The operator turns the shaft end for end, rechucks it, presses the start button, and the second end of the shaft is turned. As soon as all cuts are taken, the recorder automatically stops the feeds and spindle and starts rewinding the magnetic tape. Before the operator can remove the finished work-piece and reload the chuck, the tape has been rewound to its starting point. An accuracy of 0.001 inch is obtained.

The tape for these shafts was prepared by recording feed positions with the lathe under the control of a hand-guided tracer. Other tape recordings were made while the lathe was manually controlled.

The Giddings & Lewis special milling machine, located 50 feet from the lathe, has been programmed from the same Record-Playback Control. Changing the programming control from one machine to the other is done by throwing a switch. The three motors driving the feeds of the milling machine are shown in Fig. 4. Selsyns are geared to tachometers that are coupled directly to the motors.

Fig. 1. Diagram showing a typical Record-Playback Control system applied to a machine tool.



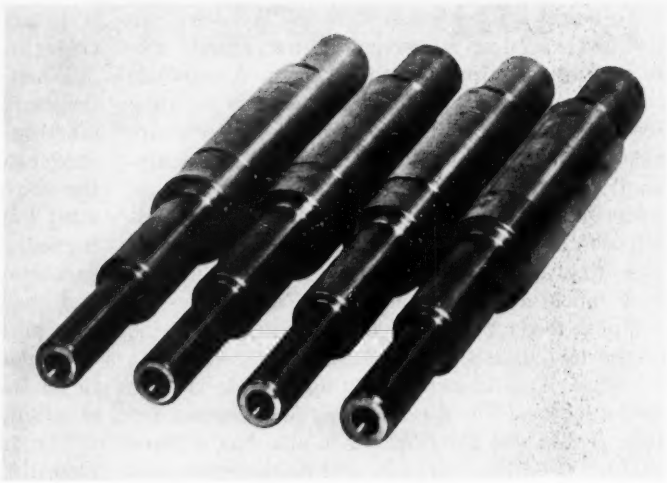


Fig. 2. All the diameters of these shafts were turned on the lathe seen in the heading illustration.

The irregularly shaped plates in Fig. 5 were profile-milled to an accuracy of 0.001 inch. In this case, Record-Playback Control programmed only the head and table feeds. The tape recording was prepared while the machine was under the control of an automatic tracer. In another application, Fig. 6, holes in steel plates were produced. The programmed feeds accurately positioned the boring tool from hole to hole. In this instance, the machine was manually controlled while the recording was prepared.

Advantages of the Playback System

Record-Playback Control imparts a high degree of automatic operation to machine tools. Standard machines retain their versatility, yet now can compete with special machines on high-production runs. The new medium can direct complete operating or processing cycles involving a coordination of virtually any number of motors, solenoids, relays, hydraulic valves, pneumatic valves, clutches, brakes, and other electrically operated devices. For machine-tool applications, the control can automatically position feeds, vary spindle speeds, index turrets, turn coolant and oil-pumps on and off, as well as operate clamping devices, loading devices, automatic chucks, and transfer mechanisms. In the process control field, such quantities as temperature, pressure, volume, flow, weight, and density can be programmed.

Magnetic tape is an ideal memory for controlling machines and processes because it is compact and easily stored. Expensive, bulky master patterns and templates are unnecessary. The tape can be played back thousands of times without introducing errors in the work-piece. When desired, an old recording can be erased, restoring the tape to its original condition ready for reuse. Changes may be made by cutting the tape and splicing in new sections as well as by erasing sections. Tapes can also be easily duplicated.

Because the magnetic tape is a complete record of each movement at every instant of the program, smooth stepless contours are reproduced with relatively simple equipment. In contrast to this, punched tape or card systems employ numerical (digital) memory, which is intermittent in nature and a record of only the key points in the movements.

Small and medium production jobs are put on a high-production basis by making substantial reductions in time. Little set-up time is required to change from one automatic cycle

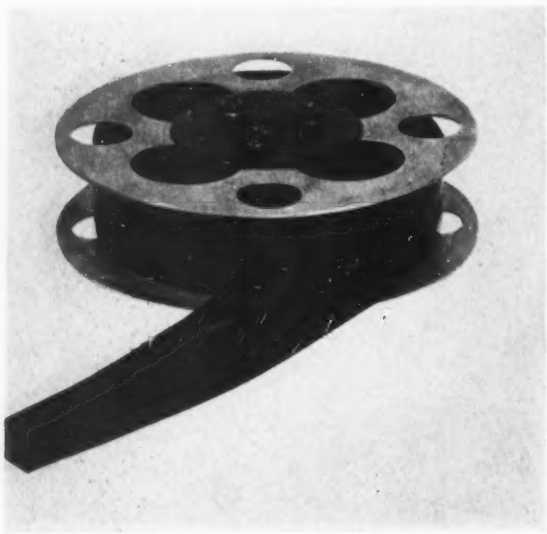


Fig. 3. Programs are recorded on a reel of magnetic tape. During playback, pickup heads reproduce the signals.

to a totally different one, and fewer tools are normally needed. It is unnecessary to orient templates or set limit switches or dogs. Inspection and measuring time are reduced or eliminated entirely. Furthermore, errors by operators are not involved.

Record-Playback Control is especially well adapted to cycles that are long and complicated, or that require too many passes for cams, templates, or other devices for storing information. One milling operation studied requires about forty long templates to program irregular shapes. Applying Record-Playback Control would cut the floor-to-floor time in half. This saving would result primarily from the elimination of the time required to change templates, make adjustments, and set limit switches.

Unusual operator skills that are difficult to reproduce on conventional automatic machines are able to be captured on magnetic tape. This applies to many assembly operations, although in most cases appropriate machines must first be designed.

Two or more identical machines can be simultaneously programmed from one recorder. Where there are insufficient jobs on one type of machine to keep the Record-Playback Control busy, the control may be alternated between two or more different types of machines, as in the previously mentioned applications to a lathe and a milling machine. The only requirement is that each machine must have individualized motor-driven feeds.

Sometimes it may be desirable to produce a work-piece of a different size than the one recorded. For example, the tape program for machining a large boat propeller can be recorded by copying a reduced size model with a template follower. A different gear ratio is then used on the playback. By other means, it is possible to obtain right- and left-hand work-pieces from the same tape recording.

A heavy-duty, professional recorder is used for handling the tape. As many as six continuous (stepless) feeds or movements and thirty-five intermittent (on–off) functions can be automatically controlled for a half-hour program from a standard 10 1/2-inch diameter reel of tape, 1 inch wide. A 14-inch diameter reel will direct a one-hour cycle. For a still longer program, a larger reel, or several 14-inch diameter reels, can be used. A sound channel for oral instructions to the machine operator can also be incorporated in the system.

Fig. 4. This view of the milling machine shows the feed motors and tachometers with selsyns geared to them.

Where work loading is performed automatically, the time required for rewinding the tape at the end of each cycle is non-productive. In such cases, a special recorder using an endless loop of tape may be used. Also, tapes wider than 1 inch are available where more than six feeds or other functions must be programmed.

Methods of Making Tape Recordings

Tape recordings are generally made directly on the machine to be programmed. However, where it is impractical to tie up the machine, then special equipment remote from the factory floor can be used to make the recordings. In this instance, the initial operating cycle is performed on a machine having light moving members or on equipment on which the movements are simulated. With either arrangement, the feed movements drive only the selsyns from which the position signals are obtained and recorded. The diagram, Fig. 7, shows the steps in the various methods of making recordings and in the playback.

Manual control of the machine is the simplest and most inexpensive method of making recordings. The operator makes a work-piece on

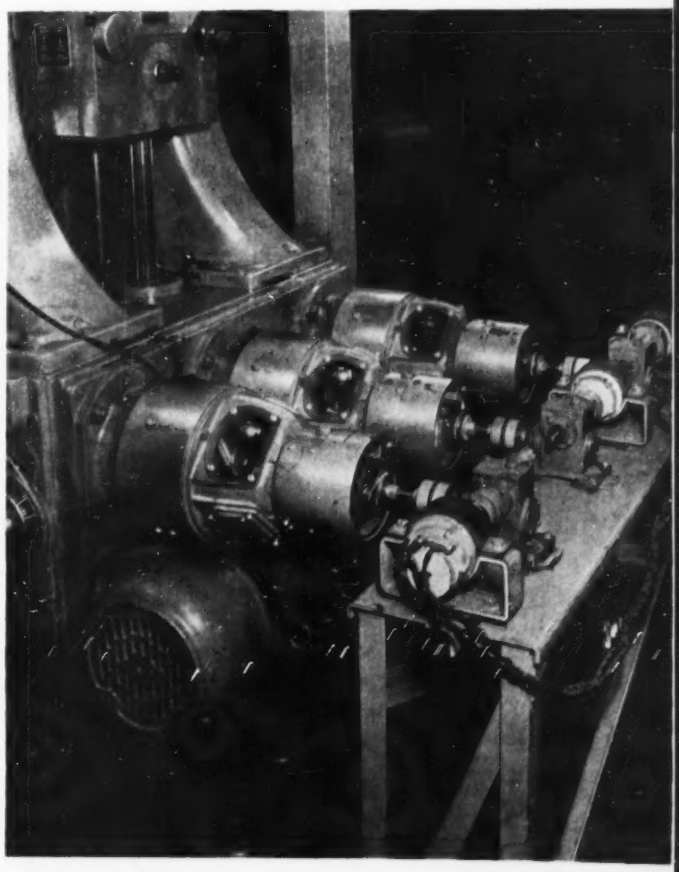




Fig. 5. The contours of these irregularly shaped plates were profile-milled on a machine that was adapted to Record-Playback Control.

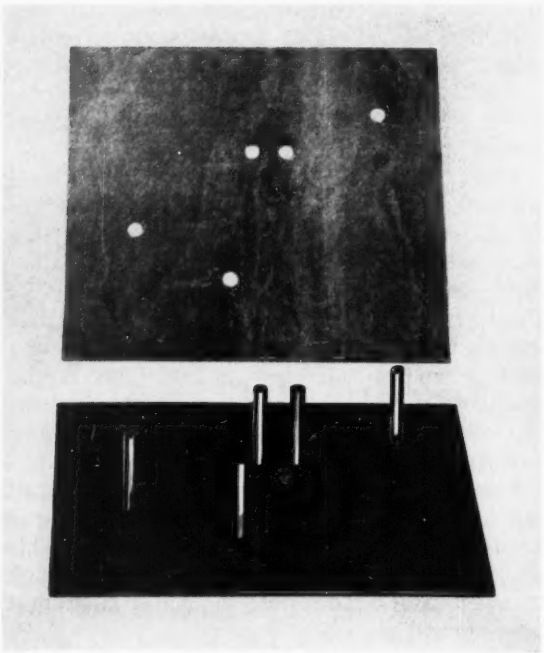


Fig. 6. The holes in the upper plate, which were located and drilled by means of the new control, accommodate the pins in the lower plate.

the machine while signals from the selsyns geared to the feeds record all of the machine movements. Usually, the movements are directed by means of the speed controls of the electronic and amplidyne drives. This gives a smoother and faster operation than is obtainable through the use of handwheels and geared feeds.

The non-productive time spent taking trial cuts and "miking" is eliminated by stopping the recorder during these operations. Still more time can be saved by setting clips on the feed micrometer dials or by arranging indicators and gage-blocks to establish the various dimensions. Where the operating cycle is too fast to be recorded properly, it may be programmed at half speed or quarter speed, then played back at normal speed.

Many advantages are realized when a tracer control is used to program a machine while the feed selsyn signals are being recorded. Since Record-Playback Control requires individualized motor-driven feeds, the additional cost of tracer equipment is only a small percentage of the complete control cost. The tracer makes it possible to record smooth contours as well as straight lines without having to stop for measurements or set up special methods of measuring while a cut is in progress. The tracer control may be manual, with a hand-guided stylus, or automatic.

Where several passes are made over one template, the return to the starting point and the adjustment for the depth of cut for each pass can be made manually or with the aid of limit switches. Should several passes of different contours be required, the recorder is shut down while templates are changed. On the playback, negligible delay is produced.

If the size of the work-piece and template are such that there is insufficient space to accommodate both on the machine for the programming, the work-piece need not be used. Here, the tracing head and template occupy the respective normal positions of the cutter and work-piece. The tape recording is then made while the tracer control follows the template. For the playback, the tracing head and template are replaced by the cutter and work-piece.

Features of Remote Recording and Machine and Tool Requirements

The familiar tracer control techniques may be applied in making tape recordings remote from the machine that is to be controlled. A simulated machine with the appropriate motor-driven feeds to position the tracing head and to drive the selsyns is used. Such versatile planning-room equipment can prepare tape record-

ings for virtually any machine tool having corresponding coordinate feeds.

Recordings can also be made from line followers, which duplicate the contours of lines on drawings, in contrast to tracer controls, which duplicate the contours of templates or models. Line followers range from simple types having a hand-guided stylus that turns the recording selsyns directly, to completely automatic types. As in the case of tracer-control recording, the line follower programs the selsyns.

Drawings are generally less expensive to make than templates, but are also less accurate. This deficiency can be overcome by making the drawings five or ten times the size of the work-piece. The selsyns can then be geared to the line follower in the appropriate ratio. In this way, errors are reduced to one-fifth or one-tenth of their magnitude, as the case may be. When the drawing size is excessive, recordings can be made from a composite of small sections of the drawing. The recorder is inoperative while sections are being changed or oriented.

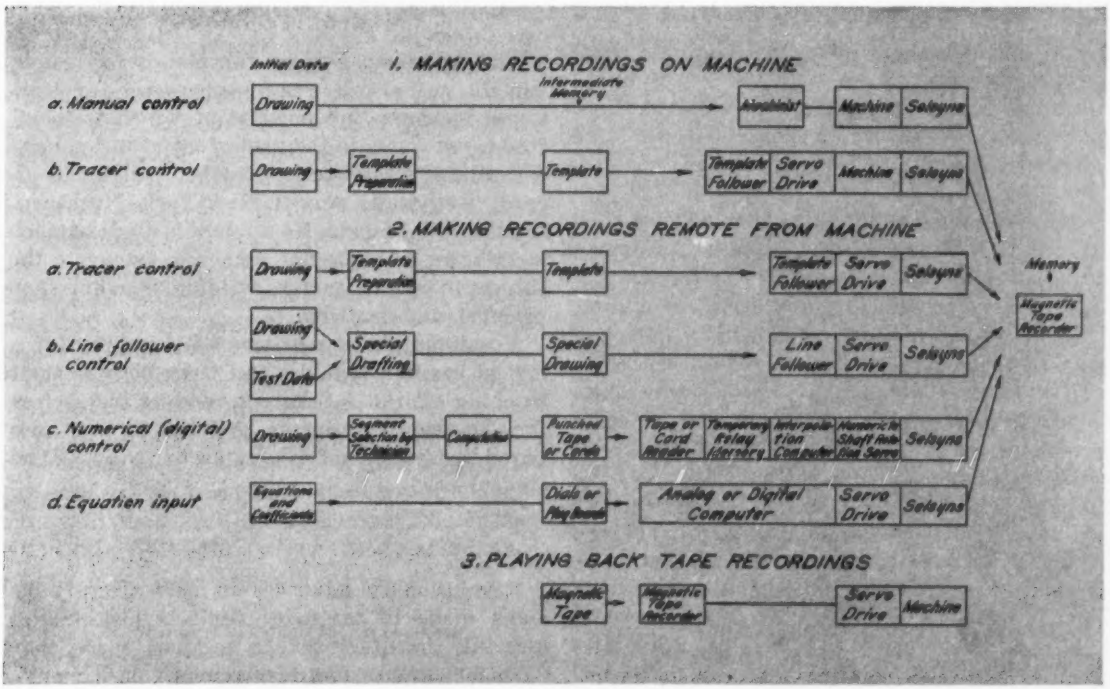
Line followers are ideal where the curves to be reproduced are initially developed or smoothed on the drafting board. This is often true of aircraft sections and turbine buckets, the curves of which are developed from test data.

Numerical, or digital, machine program controls can be used for making recordings to eliminate the need for templates or special drawings. Various key points along the contour of the work-piece to be programmed are represented by a series of numbers. These numbers are recorded in some form of digital memory. For example, they may be punched into cards or tape which, in turn, is fed into the numerical control that programs the selsyns while the recording is being made.

The numerical control requires some form of interpolation to bridge the gaps between the position points represented by successive numbers. Some controls use linear interpolation in which the contours of the work-piece are made up of a series of straight-line segments. Others use a computer to produce cubic interpolation as a means of obtaining smooth curves between the data points. Numerical controls are well adapted to accepting data that has been calculated on computers. Many computers are capable of punching cards.

In such fields as process control, it may be desirable to record a program derived from an equation having many variables. If the equation is solved on a digital or analogue computer with a selsyn output, the recording can be made directly from the computer. Regardless of the manner of making a tape recording, once it has been checked for correctness it will produce the program of operations whenever desired.

Fig. 7. A diagram indicating steps in various methods of making tape recordings and in the playback.



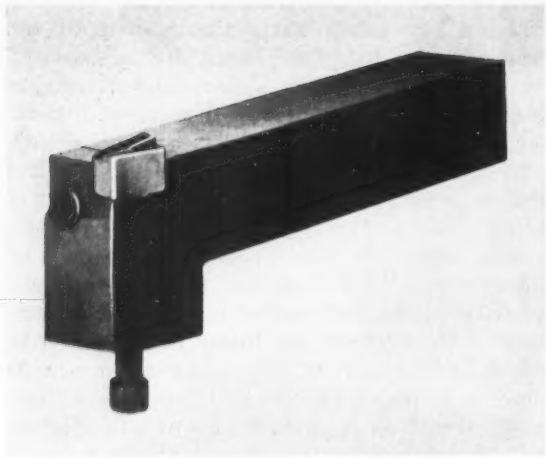


Fig. 8. Mechanically held tips often eliminate the need to adjust the tool itself when replacing a worn cutting edge.

Since the machine itself is an integral part of Record-Playback Control, applications require close coordination with the machine-tool builder. Its mechanical condition will determine performance and accuracy. Backlash, windup, carriage cocking, and other lost motions should be kept to an absolute minimum. When the control calls for a feed to reverse, the moving member will hesitate until the backlash has been absorbed. Overshooting follows as the feed rapidly tries to catch up to the command signal. For low feed speeds, the resulting error is only a fraction of the amount of the backlash. At high feed speeds, however, the error may be equal to or larger than the backlash. At normal operating speeds, the control will compensate for a large part of the backlash.

Breakaway friction, running friction, and inertia all affect performance. Stability circuits in the control are designed to minimize the influence of these factors. Of course, machining errors such as work or cutter deflection will contribute directly to errors in the finished work-piece.

The selsyns, which measure distance, are generally geared to the feed-drive motors. For obtaining a high degree of accuracy or for playing back a recording made on another machine, the selsyn should be driven from a precision rack attached to the carriage. This isolates the selsyns from the power gearing. Since lead-screws can usually be made more accurately than conventional racks, they may be substituted for racks if rigidly clamped to the machine.

The use of amplidynes makes the control flexible, in that it is adaptable to large machines requiring considerable feed power as well as to small machines, where fractional horsepower motors are used.

Record-Playback Control, like other automatic program controls, requires that the cutter be accurately positioned with respect to the work during the set-up for the initial playback. A control knob is provided to adjust each feed position. This feature permits quick micrometer adjustment of the cutter with respect to the work. The adjustment knobs may also be used when cutters are changed, and in some applications they may be used to compensate for cutter wear.

For single-point cutter applications, a tool having a mechanically held tip, such as in Fig. 8, often eliminates the need for making any adjustments for wear. The tip has four ground cutting edges—two on the top end and two on the bottom end. Tools with square, rectangular, triangular, or circular tips are available in a variety of sizes. Milling cutters are also made with replaceable inserts.

It is usually possible to have a few standard tool set-ups cover a wide variety of jobs. Special jigs can then facilitate tool adjustments. An alternative is to use tool assemblies that quickly clamp against locating surfaces so as to assure the correct cutter position in respect to the work-piece. All cutter adjustment or positioning can then be done in the tool-room.

* * *

A.S.M. Offers Training Program in Metal Technology

The American Society for Metals has established a nation-wide training program for vocational teachers, the purpose of which is to introduce students to the field of metal technology. According to the Society, teacher training is already well under way in New York, Massachusetts, and California. No attempt is made to teach metallurgy as such, but rather to integrate the subject in courses such as welding, machine-shop practice, and drafting.

Vocational and trade school teachers are in a logical position to add metal technology to their teaching efforts. A.S.M. is providing instructors for the training courses, and has already prepared text material for both teacher training and student use.

* * *

Revolutionary advances in new aircraft designs make it necessary for a typical major aircraft manufacturer to produce more than 2,000,000 square feet of blueprints each month.

Selecting, Operating, Servicing Portable Electric Tools

By Blaine B. Ramey, Research Engineer
Black & Decker Mfg. Co.
Towson, Md.

With the practice of "bringing the tool to the work" constantly being extended to new manufacturing procedures, and with membership in the fraternity of household mechanics and home hobbyists growing by leaps and bounds, portable electric tools in recent years have become part and parcel of the American scene. This article offers some valuable advice to prospective purchasers and users.

There are a number of factors that should be considered in determining the best model of portable electric tool for a specific job. Before purchasing a tool, it should be examined in regard to its weight, spindle speed, suitability of shape, safety features, and ease of maintenance. A tool may be favored because of its light weight, yet it may not have a motor powerful enough for the job at hand, since tool weight and motor horsepower are proportional. At the same time, it is impractical to use a heavy tool when a light tool can do the job equally well.

The spindle speed of a portable tool is usually established to suit its application. If speed is too high in relation to horsepower, the tool may stall in operation. But a tool of the same horsepower with a lower speed has more torque, and is less apt to stall. For proper application to the job, the speed-horsepower combination should be such that the load speed can drop off to between two-thirds and one-half of the no-load speed.

A large tool with a low speed will, of course, have ample torque to drive a small cutter, but at a rate that is too slow to be satisfactory. Thus, there are the two extreme conditions—a speed too high for a motor that is not strong enough, so that the tool stalls; and a motor strong enough but too slow, so that time is wasted.

Proper cutting speeds must also be considered in determining spindle speed. If spindle speed is excessive and the motor of the tool strong enough to sustain the speed under the load, the cutter will burn. A tool with a lower spindle speed, and possibly a less powerful motor, is indicated for this situation.

No-load spindle speeds for various sizes of portable electric drills are indicated in Table 1. The speeds given are for drilling mild steel. For soft materials, such as aluminum, these speeds can be practically double; and for harder or tougher materials, such as stainless steel or Monel metal, the speeds should be about one-half of those given.

Handles and Cords

The smaller portable electric tools, such as drills and screwdrivers, generally have a pistol-grip type handle. This permits the tool to be held

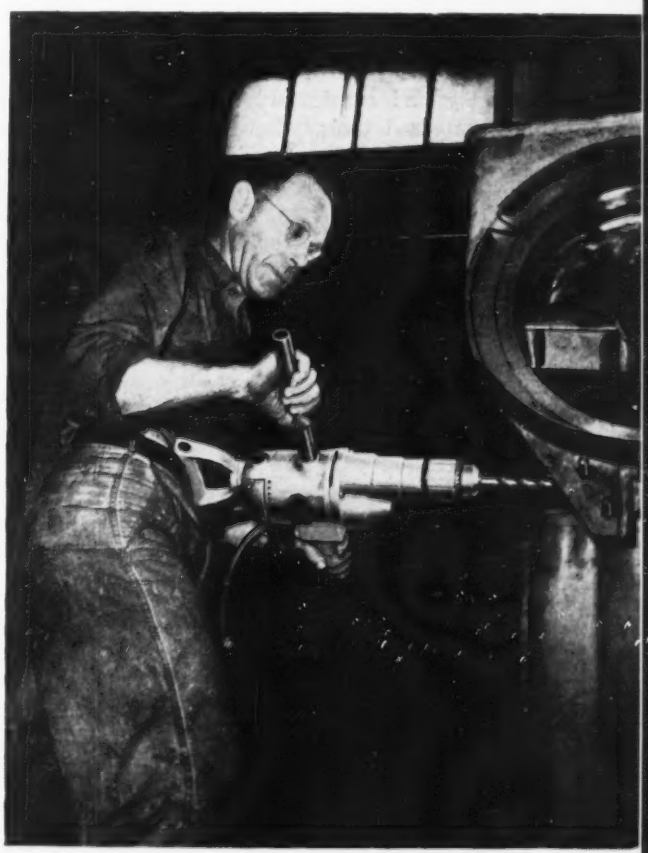


Fig. 1. It is better to use a tool that is powered to do a job easily than an under-sized tool that might be overloaded.



Fig. 2. For production work, portable tools can frequently be mounted on a bench stand in order to minimize operator fatigue.

securely and comfortably with one hand. For medium-sized tools, where there is more overhung weight, a closed end handle is better. An auxiliary side handle on low-speed high-torque models lets the operator use both hands to resist any tendency of the tool body to turn. On the larger drills and screwdrivers, side handles or pipe handles—usually located opposite the switch handle—are essential to give the operator good control over the tool.

Closed handles afford the best control for portable saws; and for grinders and right-angle sanders, straight end handles are preferred. The sanders have an auxiliary side handle at the spindle.

Every tool should have a suitable motor switch, conveniently located. The switch is generally an instant-release type. On tools like drills, screwdrivers, and tappers, the switch can have a pin for locking it in the "on" position. But on tools with cutting blades, like saws, there should be no arrangement for locking the switch "on." Still other tools, like grinders and sanders, are equipped with plunger or toggle switches. It is important that all switches be located and protected to avoid accidental operation.

Even if the tool is designed for light service, it should have a substantial cord of sufficient size to carry the full load current to the motor. When an extension cord is needed, it should be able to carry the current without too much loss in line voltage. Lamp cords should never be used.

In Table 2 are wire size requirements for various ampere capacities and wire lengths for 115-volt tools. Data are based on a current equivalent to 150 per cent of the full load, with a loss in voltage of not over 5 volts. For 220-volt tools, the wire size indicated for one-half the cord length required should be used.

The motors of portable electric tools are designed to operate satisfactorily with a variation in their nominal voltage of up to 6 per cent. Any greater variation has a pronounced effect on the motor performance. A 10 per cent drop in voltage reduces the power of the motor about 20 per cent, and the speed of operation at full load falls off considerably. (The use of the proper size of cord is obvious.) On the other hand, with an increase in voltage, motor speed increases as well, with the possibility that the motor will overheat if operated over an extended period.

Most tools marketed today come with a three-wire cord. The third wire, having green-colored insulation, is for grounding. One end of the grounding wire is connected to the tool housing, and the other end should be connected to a good ground contact, such as a water pipe, conduit, or copper rod driven into the earth. Grounding is particularly important when tools are being used in a damp area, or inside of a tank, or on metal structures that are themselves grounded. The grounding connection should always be made before the current supply connection is made.

Some wiring systems come with three-pole grounded receptacles, in which case the cord can be equipped with a three-pole plug. The prong to which the grounding wire is connected is longer than the two other prongs, so that

Table 1. No-Load Spindle Speeds for Portable Electric Drills

Drill Capacity, in Inches	No-Load Spindle Speed, R.P.M.
1/4	1700 to 2500
3/8	600 to 900
1/2	400 to 650
5/8	350 to 550
3/4	300 to 450
7/8	250 to 375
1	225 to 350
1 1/4	175 to 275

Table 2. Wire Sizes of Extension Cords for 115-Volt Tools

Cord Length, in Feet	Full-Load Ampere Rating of Tool					
	0 to 2	2.1 to 3.4	3.5 to 5	5.1 to 7	7.1 to 12	12.1 to 16
	Wire Sizes (B & S Gage)					
25	18	18	18	16	14	14
50	18	18	18	16	14	12
75	18	18	16	14	12	10
100	18	16	14	12	10	8
200	16	14	12	10	8	6
300	14	12	10	8	6	4
400	12	10	8	6	4	4
500	12	10	8	6	4	2
600	10	8	6	4	2	2
800	10	8	6	4	2	1
1000	8	6	4	2	1	0

grounding is automatically made before the current can flow through the power wires.

Caring for the Tool

With few exceptions, the gears in portable electric tools are grease-lubricated. The lubricant will remain in the gear-box for quite a long time. When it becomes necessary to replace it, all old grease should first be removed and the box thoroughly cleaned. A grade of grease recommended by the manufacturer of the tool should be used. Care should be taken not to fill the gear-box more than one-half to two-thirds of its capacity.

Ball bearings in tools so equipped are usually permanently sealed. They should never be put in cleaning fluid, as this removes the grease, which cannot then be replenished. If the tool has sleeve bearings, they are usually of an oilless type. Other sleeve bearings can be oiled through a ball valve on the tool.

Brushes are readily removed for inspection. If worn to less than 1/4 inch in length, they should be replaced; otherwise the motor will arc badly and damage the commutator. If the commutator shows roughness, it can be smoothed with fine sandpaper. A smooth, dark brush track on the commutator is normal.



Fig. 3. Safety instructions should always be heeded. In the grinding operation illustrated, there is a suitable guard over the wheel, and the operator wears goggles.

The switch should operate freely. There should be no likelihood of it sticking in the "on" position and possibly cause an accident. The cord connections with the switch and plug should be tight. If the cord is worn, it should be replaced with another of the same size.

Special Features of Tools

Portable electric screwdrivers contain a clutch that disengages the drive when the screw (or nut) has been tightened sufficiently. There are three styles of these tools. In one style, there is a positive clutch, enabling the operator to control the release of the driving torque by the pressure he applies. This screwdriver is ideal for driving wood screws, where torque increases constantly and varies widely. It is not recommended for use in metal assemblies, unless by experienced operators, since the sudden increase in torque when the screw is tightened can cause damage and injury.

In a second style, the clutch of the screwdriver is adjustable. Here, release of the driving torque is not controlled by the pressure the operator applies, but by a change in tension of a spring against which a jaw of the clutch operates. Once the torque value is set, it remains fairly con-

Table 3. Trouble-Shooting Chart for Portable Electric Tools

Fault	Check for	Remedy
New tool, motor does not operate	Brush stuck in holder, not making contact with commutator	Remove burr from brush-holder.
Tool has been in service, but motor does not operate. Takes no current	Poor contact at the receptacle	Replace plug.
	Broken conductor in cord	Cut off broken end or install new cord.
	Worn-out brushes	Replace brushes, preferably with those recommended by tool manufacturer.
	Switch not making contact	Replace complete switch mechanism.
	Open circuit in field coil	Rewind or replace field coil.
	Two or more open coils in armature	Rewind or replace armature.
Motor hums and takes heavy current, but does not operate	Short circuit in field coil	Rewind or replace field coil.
Motor operates abnormally. Slow, jerky, excessive sparking at commutator, runs hot	Short circuit in armature. Charred insulation may give location of short circuit. Solder may be thrown from connections to commutator bars affected.	Rewind or replace armature. Note: An accumulation of dirt with carbon and metallic particles between commutator bars can cause a short circuit.
Motor operates at excessive speed, gives poor operating performance	Partial short circuit in field coil	Rewind or replace field coil.
Ring fire visible around the commutator	Open circuit in armature	Rewind or replace armature.
Motor overheats, solder thrown from connections to commutator bars	Overload voltage too low	Use heavier extension cord.
	Dull cutter, requiring heavy pressure	Sharpen cutter.
	Poor motor ventilation	Clean vent holes of motor housing.
Operator gets shock	Grounding wire not connected	Connect grounding wire.
	Carbon and metallic dust on brush-holder insulation	Clean brush-holder insulation.

(Some data in this table by courtesy of the Electrical Tool Institute, Pittsburgh, Pa.)

stant until the jaws of the clutch wear appreciably. This clutch is preferred to a positive clutch for driving machine screws and fasteners in metal assembly work.

The third style of screwdriver, the impact wrench, employs a driving torque releasing mechanism that is not controlled by the pressure applied to the tool or by spring tension. Its construction is such that there is practically no torque reaction transmitted to the operator. Tool size must be carefully chosen to suit the work, because the impact can create stress beyond the elastic limit of the fastening device.

Portable electric grinders have an elongated gear housing which can be grasped by the operator's hand. The grinding wheel is mounted directly on the end of the spindle. If the tool is inadvertently dropped or hit against an object so as to damage and possibly crack the wheel, there is the danger of having the wheel fly apart. Before using a wheel, it should be examined for cracks, by being "sounded" with a solid piece of wood, such as a hammer handle.

A maximum surface speed of 6000 feet per minute should be observed for the general run of vitrified wheels, since the forces tending to break a wheel apart increase rapidly above that speed. Special bonded wheels can run at a higher speed, and require separate consideration. A quick way to determine the surface speed is to multiply one-fourth of the wheel diameter, in inches, by the speed of the spindle, in revolutions per minute. For protection, the operator must always wear goggles, and a suitable guard over the grinding wheel is mandatory.

Most saws are equipped with a lower guard that recesses into the upper guard as the tool enters the cut, and springs back over the exposed portion of the blade after the tool completes the cut. If the lower guard ever sticks and fails to spring back, the saw should be disconnected before rectifying the condition.

Unless portable electric tools have explosion-proof motors, they should never be used where there are flammable dusts or vapors, because of the arcing between the brush and the commutator. Tools subjected to an excessive amount of moisture should be disassembled, cleaned, and baked dry. Otherwise, the motor is likely to be grounded, thus endangering the operator.

It is important that the operator assume a firm stance and grasp the tool tightly, so that he can resist any sudden twisting of the tool, should it jam in the work. One operator should not use a powerful tool alone, unless it is suspended in an overhead balancer. The trouble-shooting information given in Table 3 covers the most common causes of portable electric tool failure, together with suggested means of correction.

Determining by Sound the Amount of Metal Being Removed

A methods engineer in the Aeronautical Division of the Minneapolis-Honeywell Regulator Co. has capitalized on the fact that the volume of sound in burnishing operations is in direct proportion to the amount of metal being removed. By using a microphone, an amplifier, and either earphones or a loudspeaker, sound from the burnishing wheel is amplified to guide the operator in finishing to extremely close tolerances. There is also an electronic comparator for checking dimensions. This instrument is accurate to 5 millionths of an inch, which is approximately 1/500th of the diameter of a human hair.

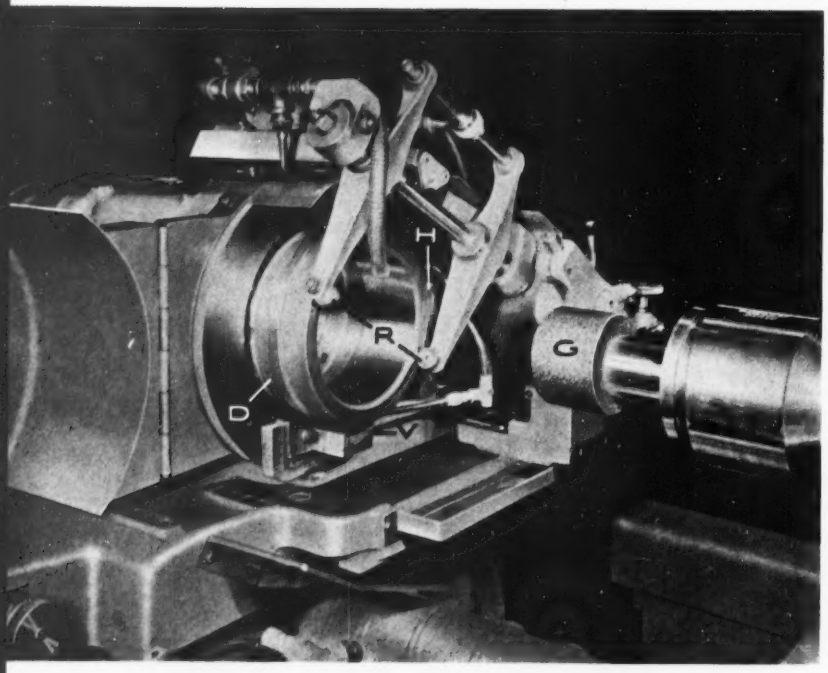


Scrap loss and operator fatigue have been substantially reduced in burnishing operations through the use of an industrial "stethoscope."

* * *

Nickel-copper ores found in Saxony early in the eighteenth Century originally were known as "Kupfer-Nickel," meaning "Old Nick's Copper." Miners gave it this name because the metal obtained could not be hammered into useful articles, and they believed the devil or "Old Nick" had cast a spell over their ores. In 1751, when Cronstedt isolated an element from similar ores he named it "nickel."

Shoe Centerless Internal Grinding



By Walter A. Boyd, Jr.
Supervisor of Machine Design
Bryant Chucking Grinder Co.
Springfield, Vt.

A NEW work-holding method for internal grinding operations now permits extremely high concentricity between the bore and some previously finished outside diameter. Instead of gripping the work rigidly in a chuck, as in conventional practice, the work is thrust against a driver plate and its rotation is supported by a pair of stationary shoes in contact with the reference outside diameter. The Bryant Chucking Grinder Co., Springfield, Vt., developer of the method, has labeled it "shoe centerless internal grinding."

The first and obvious applications of the method have been in the anti-friction bearing industry, where concentricity and roundness are synonymous with product quality. As can be seen in the heading illustration, inner rings of large ball bearings are now shoe centerless ground. A vertical shoe *V* and a horizontal shoe *H* are fixed in a rugged support mounted on the work-table. Their faces, made of carbide, seat the finished reference outside diameter *D* of the work. Shoe *V* is directly beneath the work, and shoe *H* is behind the work. Spindle rotation is opposite to standard practice, the work turning "up-in-front." The grinding wheel *G* operates along the bore and near the horizontal shoe.

Roller clamps *R* run on the front face of the work, directing pressure from an equalizing yoke to thrust the work against the driver plate. The clamps are actually ball bearings adapted with shields to keep out the grinding swarf. It is essential that the driver plate be true-running and also that the back face of the work, in contact with the plate, be normal to the reference outside diameter.

When grinding is in progress, the wheel maintains the reference surface against the shoes. However, during the rapid approach and return strokes of the wheel-slide—for loading and unloading, and for dressing between roughing and finishing—contact with the shoes is maintained solely by the resultant force obtained by locating the work center slightly eccentric to the spindle center. The relationship of the centers is shown greatly exaggerated in view A, Fig. 1. The work center *C'* can be seen above and behind the spindle center *C*, and the axes of the roller clamps intersect the work center.

An alternate arrangement to maintain the reference surface against the shoes is shown in view B. As in view A, spindle rotation is "up-in-front." Here, however, the work and spindle centers coincide, but the roller clamps are somewhat below center.

All usual features of conventional internal grinding are provided for in shoe centerless internal grinding. Automatic loading is facilitated by easy access to the shoes. The work can be loaded and unloaded in a single plane, and in

Attains New Standards of Accuracy

considerably less time than is required with a transfer arm device and chuck.

A further advantage is the ability to remove the work for gaging and then return it to the same grinding position to finish to size. Automatic gaging can be applied, and where the work is seated eccentrically, as in view A, Fig. 1, provision is made to locate the gage plug on the center line of the work. Diamond dressing is performed as in conventional practice, but since bore location now is determined by the reference diameter, bore size and roundness tolerance depend on the tolerance previously established for the reference outside diameter.

Production time gives every promise of comparing favorably with that for chucking set-ups, except in those cases where the length of the reference outside diameter requires the shoe areas to be comparatively small. Should this be necessary, grinding rates are kept purposely low to avoid too severe a load and too heavy a burnish by the shoes on the reference outside diameter. The faint burnish left by the shoes on hardened chromium-steel work is easily removed, if necessary, in a subsequent lapping or polishing operation. Perhaps most surprising of all is the complete absence of trouble from shoe wear. Carbide life appears entirely adequate for continuous-line production, once the shoes are "run in" to conform to the bearing area and adjusted for proper set-up dimensions.

A few comments can be made concerning the type of work that is best suited to shoe centerless internal grinding. Generally, closer limits are possible for a short bore than for a long bore, assuming the length of the reference surface to be the same. Both straight and tapered bores can be ground. Contours can be plunge-ground. The reference diameter may be a cylinder, a cone, or any surface of revolution, so long as tolerances are held.

The concentricity of the ground bore with the reference outside diameter is illustrated by the two characteristic gage plots appearing in Fig. 2.

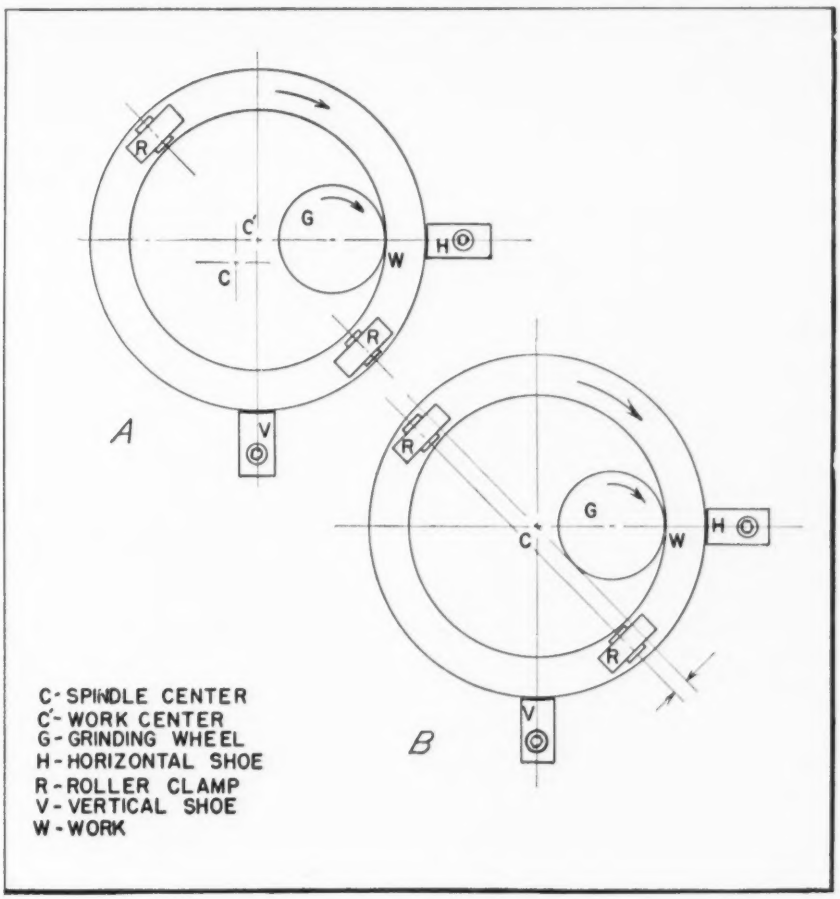


Fig. 1. The resultant forces in either arrangement of the spindle, work, and roller clamps maintain the work in contact with the two shoes.

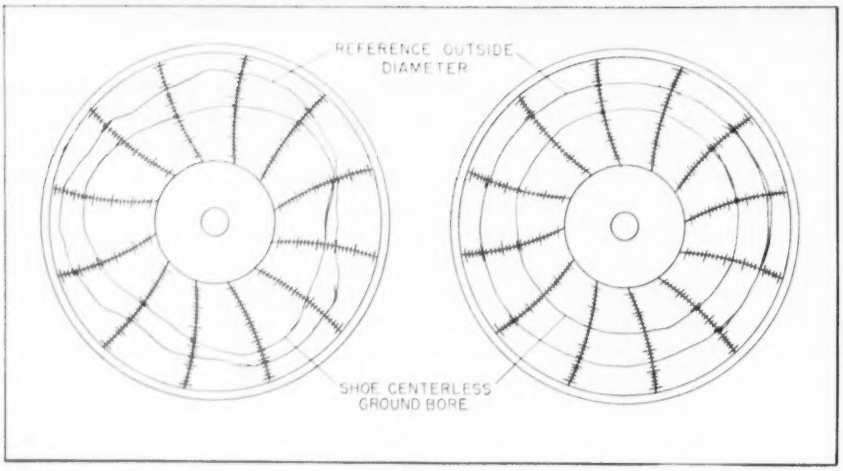


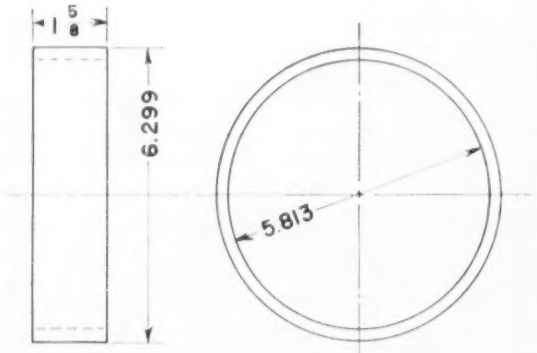
Fig. 2. Plots of a three-lobe pattern (left) and a round pattern (right). By ordinary two-point gaging methods, both of the patterns would have appeared to be round.

The plot on the left shows the duplication in the ground bore of a three-lobe outside diameter pattern; that on the right shows the bore roundness obtained with a round reference outside diameter. Plot graduations are in 0.00001 inch.

Extremely thin-walled rings can be shoe centerless internally ground to close tolerances, because the axial clamping of the work and the rugged shoe support immediately behind the grinding wheel greatly reduce distortion. The data given in Fig. 3 show the accuracies obtained in inspecting shoe centerless grinding of such rings.

* * *

The six to twelve tanks in a modern air transport plane hold approximately 10,000 gallons of gasoline, which is slightly more than the capacity of two railroad tank cars.



CLAMPING PRESSURE 250 lbs.
DRIVE ECCENTRICITY .010 ins.
CLAMPING ROLLS CONCENTRIC
MACHINE · BRYANT 1116

TOLERANCE : DIAMETER = .0005
SURFACE FINISH = 15 μ in RMS
STOCK REMOVAL: .020 ON DIAMETER
COOLANT: MICROMUL
TOTAL GRINDING TIME = 1.5 MINUTES
(INCLUDES DRESS)

3 PIECES WERE CHECKED FOR OUT-OF-ROUNDNESS ON 6 DIAMETERS ON A PRATT & WHITNEY MODEL "B" ELECTROLIMIT UNIVERSAL INTERNAL COMPARATOR. SEE CHART BELOW

DIAMETRAL STATION	PIECE # 1		PIECE # 2		PIECE # 3	
	I.D.	O.D.	I.D.	O.D.	I.D.	O.D.
1	0	0	0	0	0	0
2	.00012	.00010	.00008	.00001	.00008	.00008
3	.00028	.00030	.00007	.00002	.00010	.00008
4	.00035	.00030	-.00006	-.00012	.00006	.00004
5	.00027	.00021	-.00014	-.00018	.00000	-.00002
6	.00004	.00000	-.00010	-.00016	.00003	-.00005

Fig. 3. Because the axial thrust against the driver plate produces little distortion, it is possible to obtain a high degree of roundness and concentricity, as the data show.

Cost Reduction Program that Saved $3,800,000 in 1953

By E. E. HARTZLER, Supervisor
Factory Methods and Work Standards Department
Consolidated Vultee Aircraft Corporation
San Diego, Calif.

A VIGOROUS program to reduce operating costs has been attaining signal success at the San Diego, Calif., division of the Consolidated Vultee Aircraft Corporation. Motivated by the amount saved in 1952, Convair upped their savings to $3,800,000 in 1953—a 24 per cent increase over the preceding year. Every department of the division participates in the program and is responsible for effecting a proportionate share of the savings.

Under the direction of the Factory Methods and Work Standards Department, the cost reduction program fosters a highly active suggestion system, which is a dominant factor in its success. For hourly employes, cash awards are provided. For supervisory employes, recognition is in the form of a citation affixed to the individual's personal record, thus becoming a consideration in his advancement in the company. A group trained in cost reduction makes a thorough study of each suggestion submitted. The suggestions are analyzed carefully as to their worth and suitability to production schedules in effect.

A report is then submitted to a management committee, meeting weekly, which either adopts or rejects each suggestion. The criterion applied to a proposal is that it must show evidence of a saving over a twelve-month period, or by the termination of the contract involved, whichever period is shorter. This, of course, means that the cost of implementing a proposal must be reasonable in relation to anticipated savings. Where a suggestion submitted by an hourly employe is adopted, the committee also determines the amount of the award.

For example, a production-line innovation suggested by one employe involved a new technique for cutting window openings in Convair-

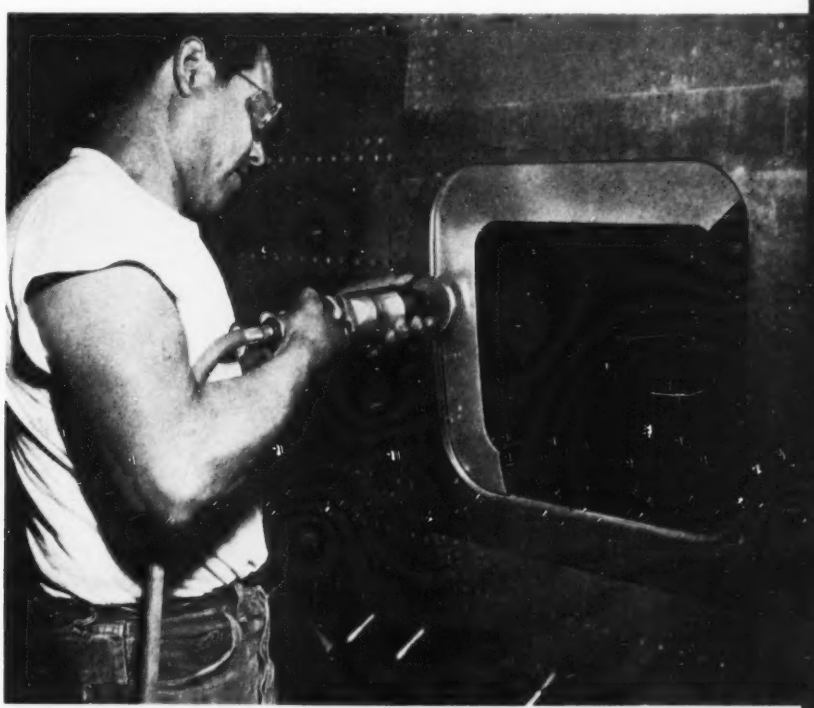


Fig. 1. Air is exhausted through the baffle on the front end of the motor, blowing the chips away from the worker.

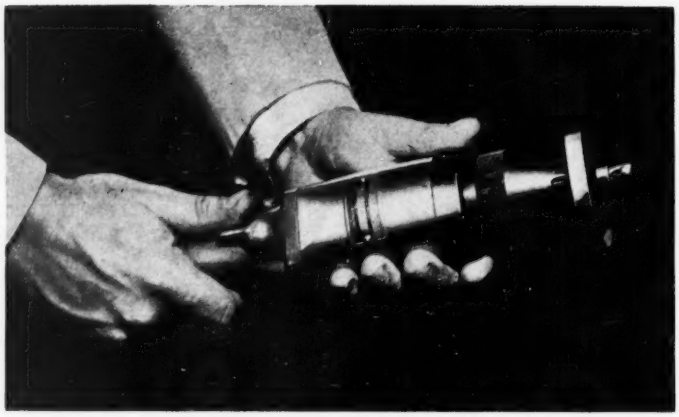


Fig. 2. Close-up view of routing tool shown in Fig. 1. The left-hand helix of the bit helps the exhausted air to dispose of chips.

Liner 340 transport airplanes. The operation is a critical one because of very close tolerances, requiring a high degree of skill. Previously, it was performed on the final assembly line. An electric motor with a 1/8-inch router bit was used to cut the opening to a template, and then an air motor with a 3/4-inch rotary file was used to smooth the surfaces. This required repositioning and laying out the window several times before an acceptable fit was obtained.

Under the improved method, shown in Fig. 1, two simple holding fixtures serve as a guide for the routing tool. A new air motor which drives the router bit is unique in that the air is exhausted through a baffle plate directly onto the cutter, blowing the chips away from the operator. A close-up view of the motor is shown in Fig. 2. The router bit, having a left-hand helix but cutting right-hand, assists the chip disposal. A reduction of 57 per cent over the previous time for the operation has been realized.

Another Convair employe's suggestion of the "Ferris wheel," Fig. 3, is saving the division about $2000 annually. This fixture makes it possible to turn belt frames to convenient positions for assembling. Previously, the frames were assembled on tables.

To clean 100 aluminum skins at a time, construction of a series of racks, one of which is shown in Fig. 4, was proposed by one employe. Rods arranged vertically separate the skins, pro-

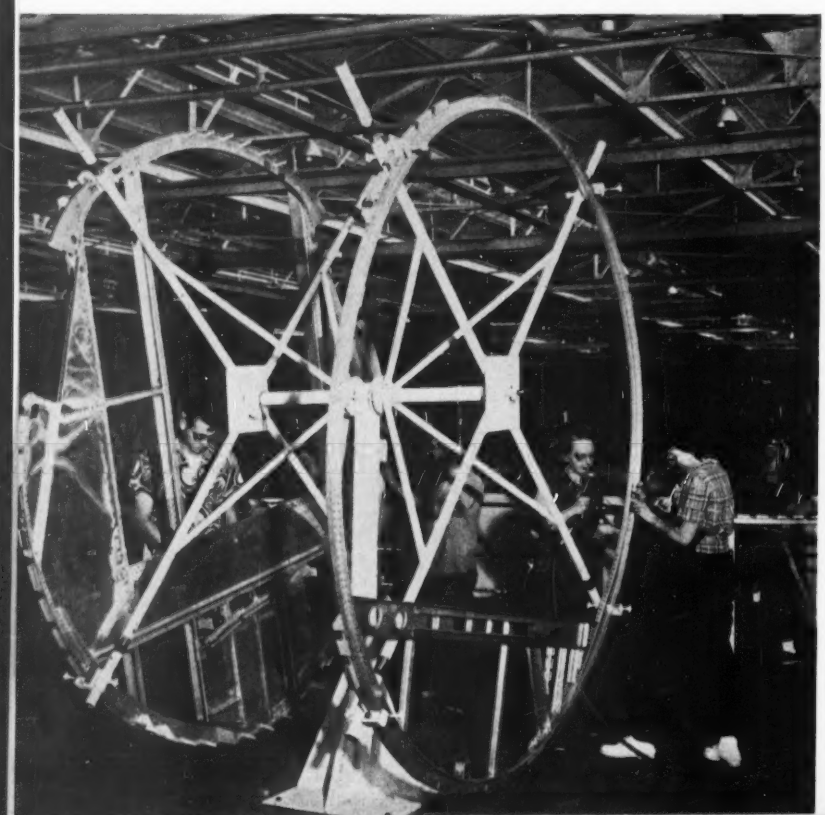


Fig. 3. Vertical assembling operations on this "Ferris wheel" now replace the awkward bench work previously required.

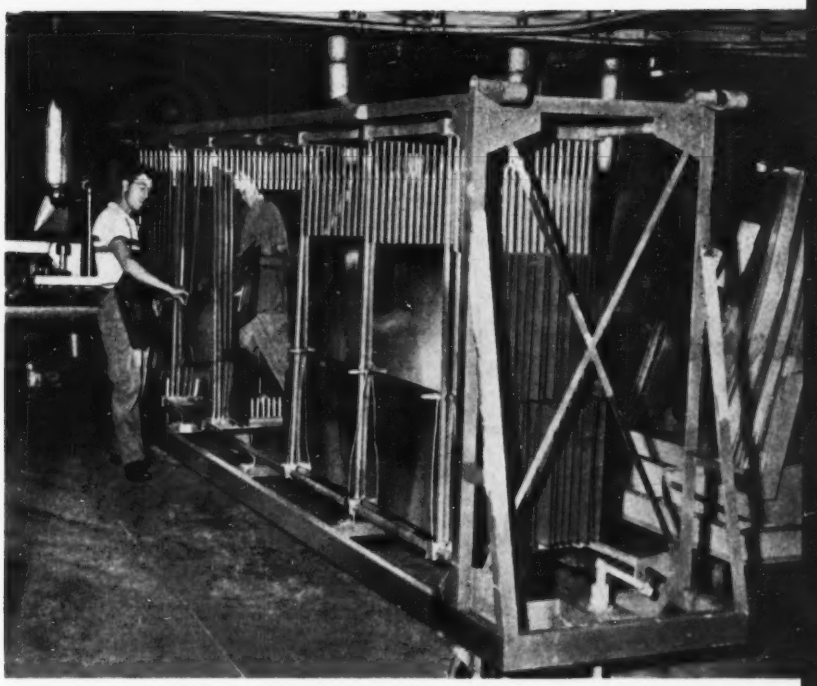


Fig. 4. This rack accommodates 100 aluminum skins, eliminating a time-consuming, hand cleaning operation.

viding sufficient space to prevent scratches and water marks. An overhead crane picks up the rack, then lowers it into the cleaning tank. Annual savings: about $6500.

An enterprising employe developed an aluminum receptacle that automatically coils aircraft wiring as it passes through stamping machines. Pivoted at the bottom, the receptacle is rotated by the action of the wire moving through the machine. The unit saves approximately $3200 annually for the San Diego division, where eighteen of these machines are in operation.

Supplementing the suggestion system is a perennial division-wide drive to conserve materials. Placards and displays dramatize the serious proportions that preventable waste assumes. As a result, in one month a 30 per cent reduction in the amount of floored hardware was made, simply by making personnel conservation-conscious. Capitalizing on the magnetism of a comely miss dubbed "Connie MacSavit," the case for conservation was boosted by her peregrinations about the various departments attired in a Scotch Highlander outfit.

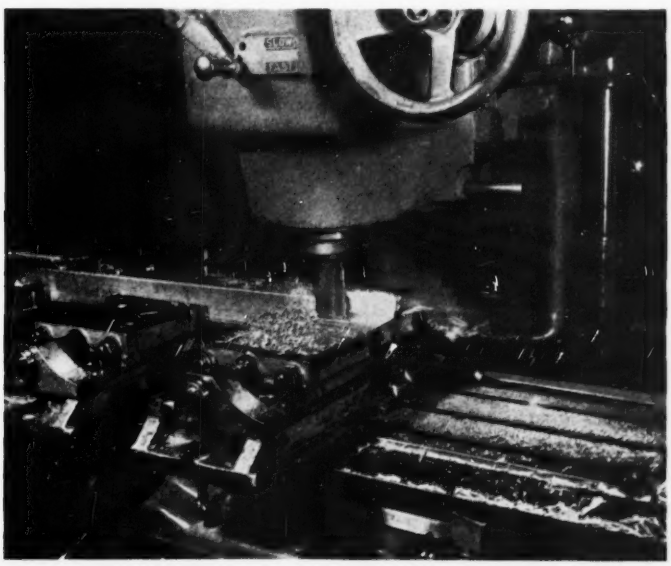


Fig. 5. Many suggestions from the machine shop concern new applications for carbide tooling, such as the vertical milling operation here illustrated being performed on a Kearney & Trecker machine.

How Form Tolerances Affect Gaging Requirements

Part IV

Tolerances are established to control variations in size, form, position, and function. In this eighth of a series of articles on dimensions and tolerances for mass production, the author shows how tolerances on form—particularly tapers—are selected and how they determine the gaging requirements

By EARLE BUCKINGHAM
Professor of Mechanical Engineering
Massachusetts Institute of Technology

No. 40 Spindle Nose and Arbor

The third example is the taper used on the No. 40 Spindle Nose and Arbor from the American Standard Spindle Noses and Arbors for Milling Machines, ASA B5.18-1943. The taper specifications for these machine tool elements are shown in Fig. 9. The size and position of the tapers are specified here by a fixed diameter at the gage line and the permissible variation in the position of the gage line. The absence of a tolerance on the diameter at the gage line avoids the introduction of redundant tolerances. This represents good practice.

The small end of the taper on the arbor is smaller in diameter than the diameter of the cylindrical pilot at the end of this component. Hence the length of the ring gage, measured from the gage line, must be made 2.616 inches or less so that its smaller opening will be large enough to permit the taper ring gage to pass over the cylindrical pilot.

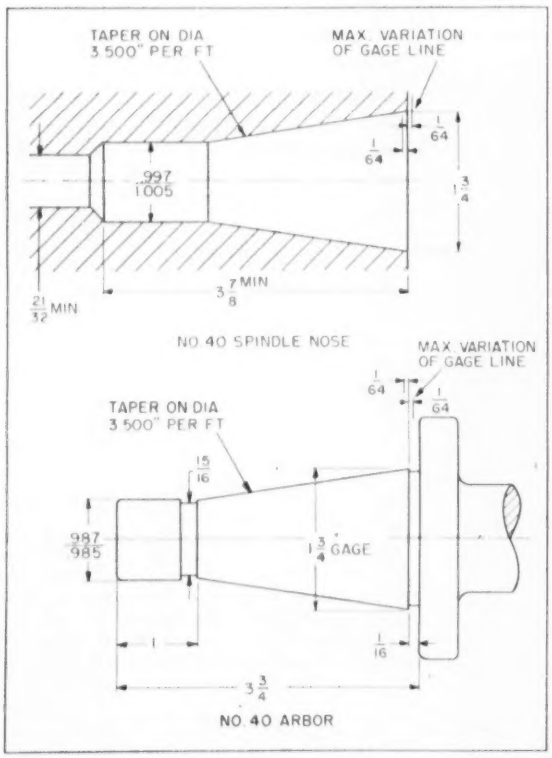


Fig. 9. A more complete specification of the American Standard No. 40 Spindle Nose and Arbor here shown would provide form tolerances on the tapered surfaces.

Need for Specifying Form of Taper—The tolerance on the position of the gage line permits a variation of something greater than plus and minus 0.005 inch on the diameters of these tapered surfaces. Here also the form of these tapers is much more important than their actual sizes, but the specifications make no mention of this condition. The tolerance band established by the specified tolerance on the position of these tapers permits a considerable variation in form.

To be complete and precise, and to make these specifications adequately represent the required functional conditions, some specification of the accuracy of this tapered form must be included. This is accomplished by giving a tolerance on the form of the taper such as *Taper on Diameter, 3.500±0.0015 inch per foot.* This form requirement is inspected by the use of the double taper gages, as has been described before.

The Gages Required—The gages for the taper on the No. 40 spindle nose, including the double

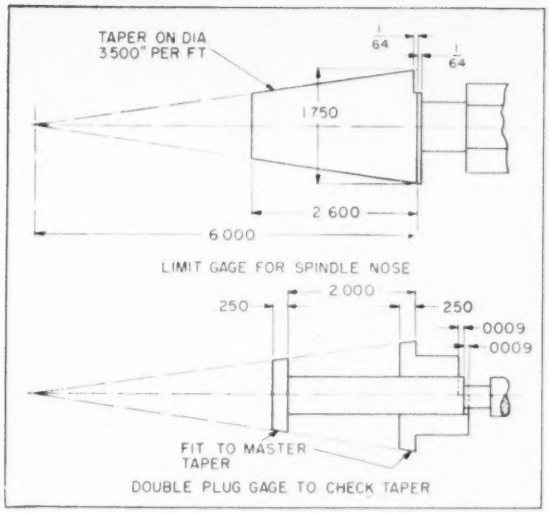


Fig. 10. (Top) Limit gage used to check the position of the spindle nose taper. (Bottom) To determine the accuracy of the form of the taper, the double plug gage shown may be used.

taper plug gages, are shown in Fig. 10. The distance from the gage line to the apex of the cone of the taper in this example is 6.000 inches. The 2.000-inch distance between the two sections of the double taper plug gage is established from the actual positions of the two narrow plug gages in a master taper ring gage. The steps on the collar of the larger taper plug gage are made 0.0009 inch either side of the datum shoulder on the stem of the smaller taper plug gage. This value is determined as before, and is equal to $0.0015 \times (2.000 \div 12) \times (12 \div 3.5)$ which is equal to 0.0009 inch.

The gages for the corresponding arbor, including the double taper ring gage and the distance piece, are shown in Fig. 11. As before, the actual length of the distance piece for use with the double taper ring gages is established from the measured positions of these gages on a master taper plug gage. Then the GO distance is made 0.0009 inch less than the measured distance, and the length of the NOT GO distance is made 0.0009 inch greater than this measured distance.

1-Inch Ball Stud and Socket

The next example is a 1-inch ball stud with a taper shank and its socket, copied from an obsolete standard of about a generation ago. This particular example is chosen because of its combined and interrelated conditions of size, form, and position. Unless great care is used to segregate the tolerances on the different types of conditions in such cases, redundant or superfluous tolerances will exist. Such tolerances always create confusion.

Faults in Original Specifications—The original dimensional specifications for these components, shown in Fig. 12, are inconsistent and leave open many opportunities for differences of opinion or interpretation. The original specifications give the dimensions of the ball stud, many of them as fractional sizes without tolerances, the size of the tapered socket for the ball stud, and the assembled conditions of the pair with tolerances for the conditions of assembly.

The taper on diameter is 1.500 inches per foot. This gives a ratio of length of taper to increase in diameter of 8 to 1. A tolerance of plus or minus 0.002 inch is given for the diameter at the large end of the taper. Therefore this tolerance on the diameter permits a variation of plus or minus 0.016 inch in the axial position of this taper.

A check of the design sizes and of the relative position of the ball stud in relation to its tapered socket gives the following results: The difference between the diameter of the tapered shank at its large end and that of the tapered socket at its large end is equal to 0.01025 inch. This brings the design position of the large end of the taper on the ball stud a distance of 0.082 inch beyond the large end of the tapered socket. The toler-

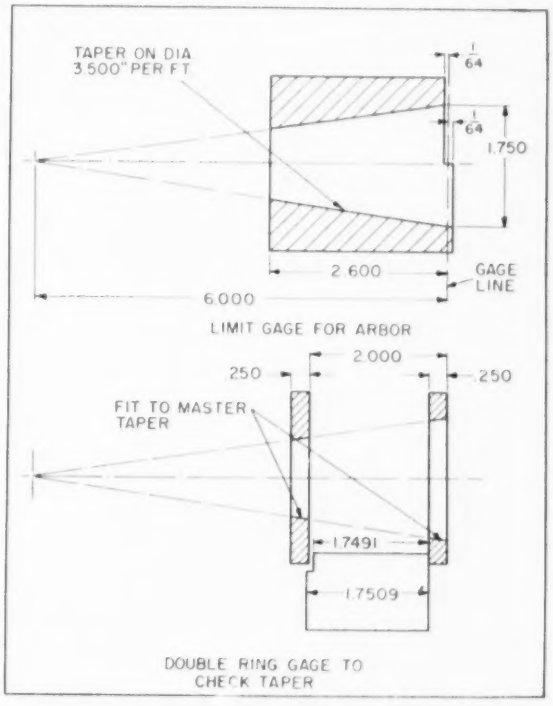


Fig. 11. (Top) Limit gage used to check the position of the No. 40 arbor taper. (Bottom) Double ring gage used to determine the accuracy of the form of the taper.

ance on the diameter of the taper of the socket permits this distance to vary plus and minus 0.016 inch from this position. A similar tolerance on the diameter of the taper of the ball stud permits a further variation in position of the same amount. Hence the position of the large end of the tapered shank on the ball stud beyond the large end of the taper of the socket can be 0.082 inch, plus and minus 0.032 inch.

The distance from the large end of the tapered shank on the ball stud to its small end is given as 3/4 inch, without a tolerance. Some tolerance may be assumed for this value, but none is given. The maximum depth of the socket is 31/32 inch. When this value is added to the 0.082-inch projection of the large end of the tapered shank of the ball stud beyond the large end of the taper of the socket, the value is 1.05075 inches. Subtracting the length of the tapered shank of the ball stud from this value, the shoulder of the ball stud at the small end of the tapered shank will be close to 0.300 inch above the bottom of the tapered socket when the length of this member is of maximum metal size (31/32 inch); and 0.176 inch above the bottom of the tapered socket when its length is of minimum metal size (27/32 inch). When the variation in position because of the tolerances on the diameters of the tapers is introduced, the distance between the small end of the tapered shank on the ball stud and the bottom of the socket may vary from 0.332 inch to 0.144 inch. This seems to be a

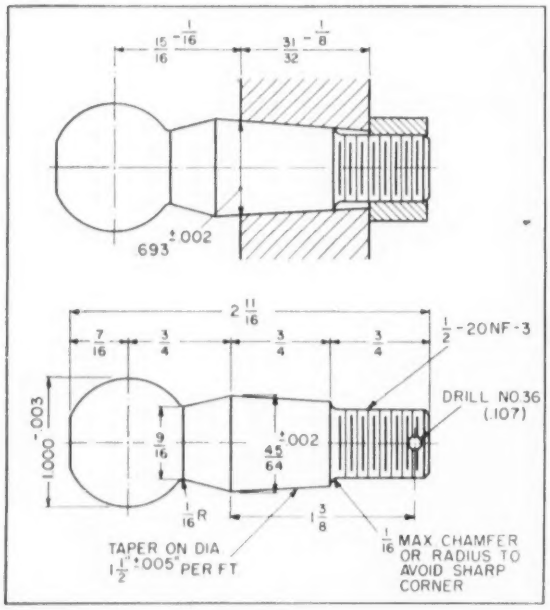


Fig. 12. Ball stud taken from an obsolete standard provides an interesting problem in taper specification. The dimensional specifications shown are inconsistent and therefore subject to misinterpretation.

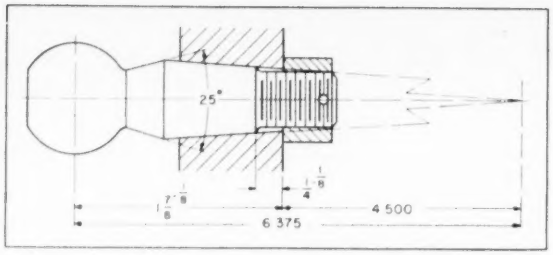


Fig. 13. The first step in establishing more exact specifications for the ball stud in Fig. 12 is to define the limiting conditions of assembly.

greater amount of variation here than necessary. In any event, the small end of the tapered shank on the ball stud will never project beyond the bottom of the tapered socket.

The distance from the large end of the tapered shank on the ball stud to the center of the ball is specified as 3/4 inch, without a tolerance. Adding this value to the distance of 0.082 inch that the large end of the tapered shank projects beyond the large end of the taper of the socket, a value of 0.832 inch is obtained as the mean or design size position of the center of the ball beyond the large end of the taper in the socket. When the variation in position introduced by the tolerances on the diameters of the tapers is included, this position of the center of the ball above the large end of the taper in the socket will vary between the values of 0.862 inch and 0.798 inch. But the specified assembled position is between the distances of 0.9375 inch and 0.875 inch. Here is a possible discrepancy of about 0.075 inch.

In this example there are many redundant tolerances and much confusion. The surface at the large end of the tapered socket is seldom finished while the surface at its small end is always machined. The position of the taper in the socket should be located from the finished surface at the small end of the taper in the socket. Also the position of the taper on the ball stud should be registered from the shoulder at the small end of the tapered shank because the intersection of the tapered shank and the conical surface under the ball is of no functional importance.

Establishing More Exact Specifications—In many respects, this problem is similar to that of the chamber of a rifle. This is a difficult pair of mating components for which to establish definite dimensional specifications with tolerances, unless some integrated and consistent system or practice of dimensioning with tolerances is followed. This example includes several interrelated conditions of size, form, and position. These must be separated from each other in order to avoid redundant tolerances.

The first step toward this end is to establish the limiting conditions of assembly. An attempt to do this is shown in Fig. 13. It is assumed that a variation of 1/8 inch is permissible between the finished surface at the small end of the taper in the socket and the center of the ball. This is 1/16 inch less than the amount now permitted by the original specifications. This variation may be made even smaller without imposing restrictive tolerances when the influence of redundant tolerances is avoided. It is also assumed that the clearance between the shoulder at the small end of the tapered shank on the ball stud and the bottom of the tapered socket may vary between the values of 1/4 and 1/8 inch. This amount of clearance here is ample. All essential positions are dimensioned from the apex of the taper cone of both tapers. This eliminates all danger of redundant tolerances. The taper surface itself then becomes the primary locating surface or datum for all conditions of position. When any axial position is measured from the face of a taper gage of basic size, then the measurement is, in effect, a measurement from the apex of the cone of the taper, regardless of the actual size of the tapered surface on which the gage is located.

The revised dimensions of the ball stud and of its tapered socket are given in Fig. 14. On the ball stud, the shoulder at the small end of the tapered shank and the distance to the center of the ball are both located from the apex of the cone of the taper. The position of the drilled hole and the end of the threaded stem at the end of the ball stud are both located from the apex of the taper cone. Under these conditions the component will be located in a tapered ring of basic size when the hole is drilled, and this will maintain its position in relation to the cone apex and the small end of the tapered socket, regardless of the actual size of the tapered surface on the component.

The form of the conical shoulder below the ball is dimensioned as a profile with constructional dimensions and with a metal tolerance to control its size. The intersection of this conical shoulder with the large end of the tapered shank on the ball stud is incidental and can come where it may. The ball end and the conical shoulder can be made by a single form tool. The metal tolerance on this conical shoulder permits a variation in the form of this tool. The tool would be adjusted to maintain the ball diameter and the position of the ball from the apex of the taper cone. The tapered shank is formed by an independent tool. The position of this tool would be adjusted to meet the gage requirements.

The position of the tool which finishes the shoulder at the small end of the tapered shank would also be adjusted in relation to the tapered surface to meet the gage requirements. The cut-off tool would be adjusted in relation to the form tool that finished the ball end. The stop for the feed of stock would be adjusted in relation to the tapered surface of the ball stud, or the position of the tapered shank would be adjusted to the position of this stop.

The over-all length of the ball stud will be what it may. This is one of the least important of the dimensions. A calculated value, based on the design sizes, is given to establish the amount of stock required to produce the part and for any other reference use. It is not a dimension that requires inspection.

The taper for the socket is dimensioned from the apex of the taper cone. The position of the finished surface at the small end of the tapered socket is given from the same apex. The size of the tapered socket is gaged from its small end.

Gages that are Required—The taper ring gage for the tapered shank of the ball stud is shown in Fig. 15. This gage registers from the shoulder at the small end of the tapered shank and has a limit step of 0.062 inch, corresponding to the tolerance specified on the detail drawing for the position of the small end of the tapered shank from the taper cone apex. A simple template gage for the position of the end of the threaded

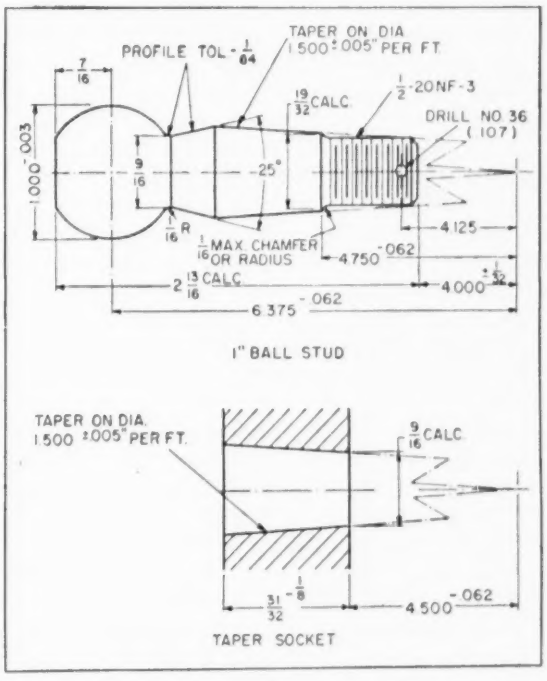


Fig. 14. Revised dimensions of the ball stud and its tapered socket which eliminate inconsistencies present in Fig. 12.

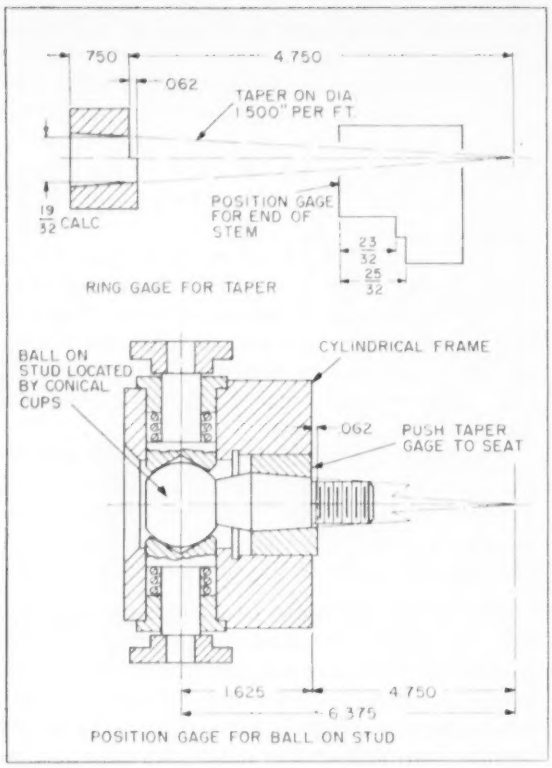


Fig. 15. Gages employed to check the revised ball stud. (Top) Ring gage for checking the position of the tapered shank. (Bottom) Gage used for checking position of the ball on the stud

stem is also shown on the same drawing and it registers from the GO step on the taper ring gage. When the position of the end of the threaded stem is measured from the face of a taper ring gage of basic size, the position of this surface as dimensioned from the apex of the taper cone is actually being checked.

In addition, the gage to check the position of the ball is shown in Fig. 15. This gage consists of a frame, probably cylindrical in form, in which two cylindrical holes are provided at the center line of the ball and at right angles to the axis of the cylindrical frame. These holes receive spring plungers with conical cups at their ends to engage and position the ball. They are also beveled at their outer edges to facilitate the insertion of the ball. The springs must be stiff enough to hold the ball firmly in position. Knobs are shown at the outer ends of these spring plungers for use if needed when the ball end is inserted and removed.

Another cylindrical hole, at right angles to the plungers and concentric with the cylindrical frame, is provided to clear the body of the ball stud. This hole is enlarged or counterbored at one end of the cylindrical frame to receive a taper ring gage. The outside diameter of this ring gage must be smooth and of the correct size to fit the enlarged hole in the frame. This taper ring gage may be the same one that is used to check the size and position of the tapered shank of the ball stud. The gage step at the small end of the taper of this ring gage registers against the end of the cylindrical frame. The positional tolerance for the ball and the shoulder at the small end of the tapered shank are alike, hence the same limit steps are used for both measurements. As the taper ring gage is of design size at the GO step, in effect this measurement is a measurement from the apex of the taper cone to the center line of the ball.

In operation, the ball stud is assembled into the taper ring gage and then inserted into the frame where the ball is engaged by the cone-cupped spring plungers. The GO step of the taper ring gage must be flush with or below the end surface of the frame. The NOT GO step of the taper ring gage must not be below the end surface of the frame. This gage is designed so that it can be used at the screw machine to check the position of the cutting tools when the machine is set up for production.

A double taper ring gage with a distance piece to check the accuracy of the taper on the taper shank of the ball stud is shown in Fig. 16. These rings might be made thinner, say 3/16 inch instead of 1/4 inch. If 1/16 inch were ground off the small end of the larger ring and 1/16 inch off the large end of the smaller ring, this would increase the distance between them to 3/8 inch and the distance between their gaging faces to 9/16 inch. The limit steps on the distance piece would be increased from plus and minus 0.00166 inch to plus and minus 0.00187 inch. The distance between these taper ring gages is established from the actual distance between them when assembled on a master taper plug gage, and the limits applied accordingly.

A limit snap form gage is also shown in Fig. 16. This gage is to check the form and size of the conical shoulder below the ball end. This is not the most accurate type of gage for the inspection of a profile but it is the most rapid type to use, and is adequate in this particular case because the accuracy of form here is of very little importance.

A taper plug gage for the tapered socket is shown at the top in Fig. 17. This gage registers from the small end of the taper and against the finished surface of the socket at this end. This gage has steps 0.062 inch apart to correspond with the tolerances given on the detail drawing. A double taper plug gage, similar to those described before, to check the accuracy

of the taper in the socket is seen at the bottom in the illustration. Steps are provided on the collar of the larger taper plug gage to register with the shoulder on the stem of the smaller taper plug gage as before.

No gages are shown for the several conditions of size, such as the diameter of the ball end, size of the threaded stem, and so on. These are of the conventional types.

The dimensional specifications given in Fig. 14, together with the gages shown to check them, would certainly result in a more consistent form and size of product than do the original specifications shown in Fig. 12. Once the gages and the tools have been made and set up, the manufacturing costs would not be increased over those for parts made to the original specifications. In addition, the number of controversies between the production and inspection departments would be greatly reduced.

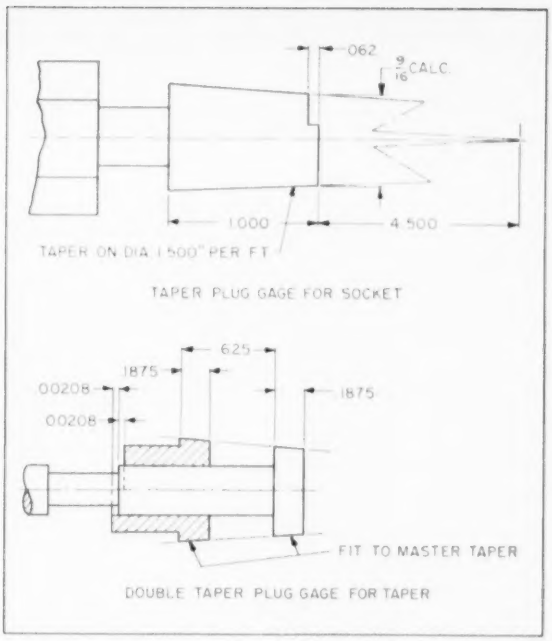


Fig. 17. (Top) Taper plug gage for the position of the tapered socket shown in Fig. 12. (Bottom) Double taper plug gage to check the accuracy of the form of the taper in the socket

Angles and Polygons

The angular relation of several surfaces or features to each other, and the expression of tolerances for them, may be a problem of conditions of form or position. The angles between the centers of several holes spaced around a bolt circle are conditions of position. The degree of squareness between two surfaces which affect the functional conditions of operation of the product is more a problem of position than of form. Problems of symmetry and of alignment are also problems of position rather than of form. The accuracy of polygons used as the forms of nuts and bolt heads may involve angles, but these are primarily problems of the dimensioning of forms. When the accuracy of the form itself is important, then it is very similar to that of the accuracy of the cylindrical form as distinguished from its accuracy of size. The consideration here of the problems of tolerances involving angles is therefore limited to those of regular polygons which are used for the forms of nuts and bolt heads.

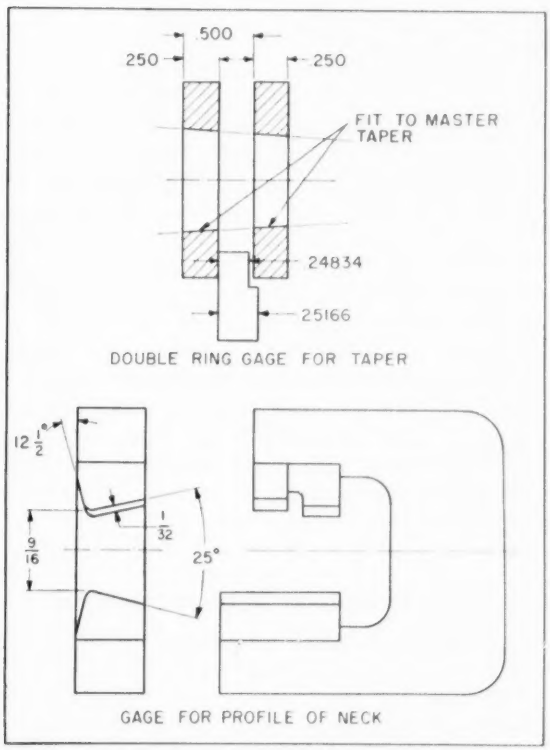


Fig. 16. (Top) Double ring gage used to check the accuracy of the tapered shank of the ball stud. (Bottom) Limit snap gage for checking the form and size of the conical shoulder below the ball end of the stud

Square and Hexagonal Bolt Heads—The dimensional specifications of 7/8-inch square and hexagonal bolt heads are shown in Fig. 18, together with the tolerance bands established by these specifications. A strict interpretation would require the use of a gage representing the maximum metal limits of the product for the GO gage and two NOT GO snap gages, one representing the minimum distance across the flats and the other the minimum distance across the corners. Any form that lies within the tolerance band established by the tolerances will

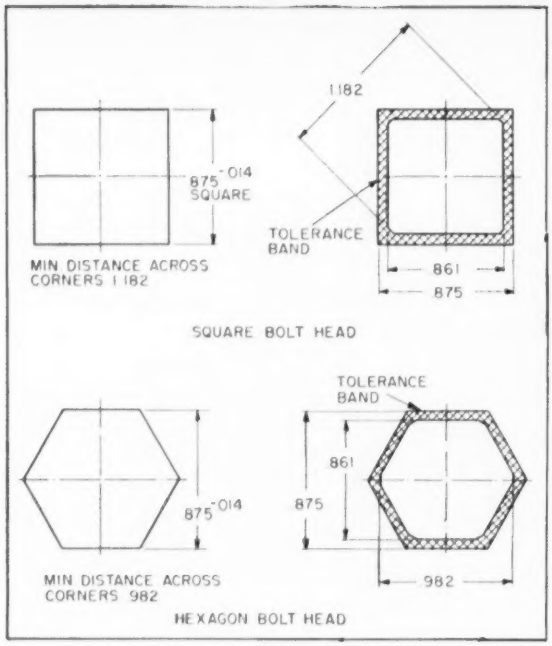


Fig. 18. Tolerance bands for the heads of square and hexagon head bolts established by the corresponding dimensional specifications

meet these specifications. If the form itself should be more important than its size, then an additional specification must be added which would limit the departure from true form. This form would then be checked against a master form, as for any other profile condition.

If open-end wrenches only are to be used on these bolt heads, a GO snap gage is substituted for the profile receiving gage. Where socket wrenches are used, the profile receiving gage is necessary because a component of full maximum metal size must be perfect in form to remain within the specified tolerance band.

Further consideration of tolerances on dimensions of angles will be given with the discussion of tolerances on conditions of position and with the specification of requirements in terms of functional gages.

Landis Machine Co. Celebrates Fiftieth Anniversary

THE Landis Machine Co., Waynesboro, Pa., in an attractive brochure is paying tribute to the men responsible for the founding of the concern, and the progress made through fifty years of existence. The idea on which the business was started was conceived in 1887 when A. B. Landis, then employed by the Geiser Mfg. Co., of the same city, developed his first thread-cutting die-head.

This original Landis die-head employed a tangential chaser which represented a radical departure from the then-accepted design of thread chasers. It constituted a basic principle from which designers of Landis die-heads have never departed.

Concurrently with the die-head development of A. B. Landis, a cylindrical grinding machine was designed and built by F. F. Landis, a brother. In 1890, the two brothers formed a partnership for the purpose of commercializing their inventions. The grinding machine met with immediate acceptance and the partnership prospered until a disastrous fire in 1897 destroyed most of the manufacturing facilities.

A stock company, the Landis Tool Co., was immediately organized to rebuild and re-equip the plant. Following the formation of this company, A. B. Landis resumed work on the further development of his thread-cutting die-head. An improved die-head was patented in 1901, and a threading machine incorporating the new head was built. However, the officials of the Landis Tool Co. felt that to organize a separate company for the threading equipment business would be wiser than to attempt to make grinders and threading machines in the same plant.

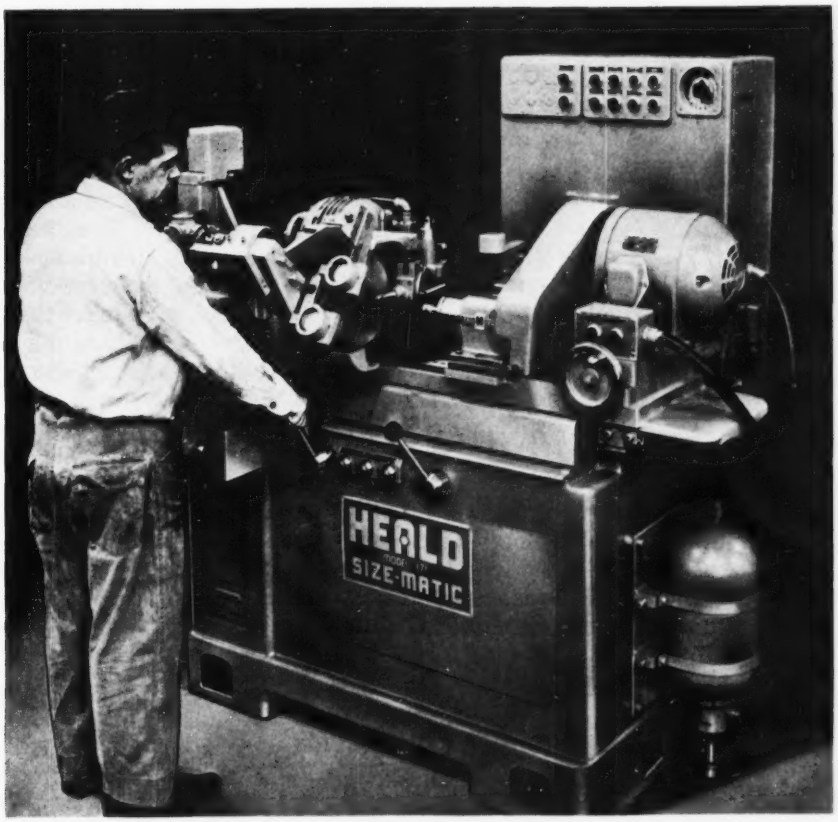
As a result, the Landis Machine Co. was organized in 1903. Bolstered by faith in a new idea which repeated failures could not shake, Frank F. Landis, John G. Benedict, and Harry L. Fisher persevered and started the struggling enterprise on its successful career.

* * *

Sound Film on History of Forging

A twenty-minute, 16-millimeter, black and white sound film entitled "5000 Years of Forging," has just been completed by the Utica Drop Forge & Tool Corporation, Utica, N. Y., and is available for distribution to industrial and trade associations, schools, and educational groups. Requests for the film should be directed to Henry J. Zellweger, advertising manager of the company.

Boring and Grinding Machine Maintains Work Concentricity



NEW applications, both military and industrial, continue to be made for small cable-connected synchro motors. Many automatic remote control systems are operated by these mechanisms and it is anticipated that they will soon be used extensively in connection with radio and television tuning.

One of the essential elements of the synchro motor is its stator and housing assembly, several of which are seen in Fig. 1. The stator consists of a series of silicon steel stampings. These stampings, or laminations, are in the housing, which is made of aluminum. After assembly, the inside diameter of the stator is ground. The large and small diameters at the respective ends of the housing are finish-bored and serve to seat bearings which support the rotor shaft. A high degree of concentricity must be maintained between these diameters so that there will be a constant air gap between the stator and the rotor. Specifications also require that there be no tool "dragline" left in the bearing surfaces of the finished housings.

In a conventional procedure, the assembly would require two distinct operations, grinding and boring, on separate machine tools. Transferring the work from one machine to another, however, proves impractical because of the concentricity requirements between diameters. Furthermore, the non-productive time involved in transferring the work would be high in relation to actual machine time.

Engineers of the Heald Machine Co., Worcester, Mass., built for the job the special combination grinding and boring machine seen in the heading illustration. Adapted from the company's standard line of Size-Matic internal grinders, the machine has a boring unit in addition to the grinding table. Grinding and boring are performed sequentially. Upon completion of the grinding cycle, the table is locked out and a boring arm unit is actuated, initially pivoting to-



Fig. 1. These small stator and housing assemblies are precision elements of synchro motors.

ward the center line of the work to bring the tungsten-carbide boring tools into proper relationship to the work surfaces. Electronic controls for the hydraulic system, grinding wheel motor, work-head motor, and wheel dresser are centralized in a "brain" behind the machine.

In the two close-up views, Figs. 2 and 3, are shown the boring unit in retracted and operating positions, respectively. The work *A*, Fig. 2, is held in a special finger locator that was stepped to receive the outside diameter of the shoulder—the abutment of the back face of the shoulder against the step establishing the length of the front bore. To grip the work, pressure is applied laterally (to prevent any out-of-round condition) by pull-back jaws *B* which bear against the front face of the shoulder.

In the standard Size-Matic grinding cycle, the table rapid-traverses up to the work, then feeds slowly, the wheel *C* rotating at approximately 26,000 R.P.M., and the work at 1000 R.P.M. The stator bore is rough-ground and the wheel is retracted from the work. Then the wheel is automatically dressed by a hydraulic diamond dressing mechanism, and the cross-slide *D* adjusts itself slightly to compensate for the reduced wheel diameter after dressing, and the finish-grinding pass brings the bore to exact size. Approximately 0.007 inch of stock is removed in the two passes, which are completed in twenty-six seconds.

Following grinding, the table is locked in running out when it trips a limit switch. The switch energizes a solenoid valve in the hydraulic system. Simultaneously, shaft *E* (Fig. 3), which carries the boring arm unit, moves out. As the shaft reaches the end of its pre-set stroke, it trips another limit switch, causing the unit to pivot

Fig. 2. The boring unit is in a retracted position while the stator is being ground.

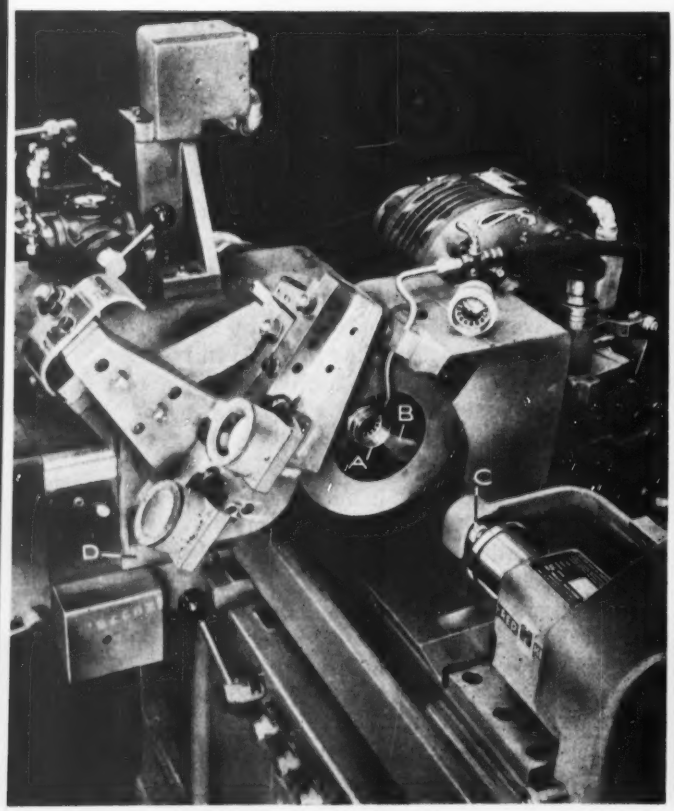
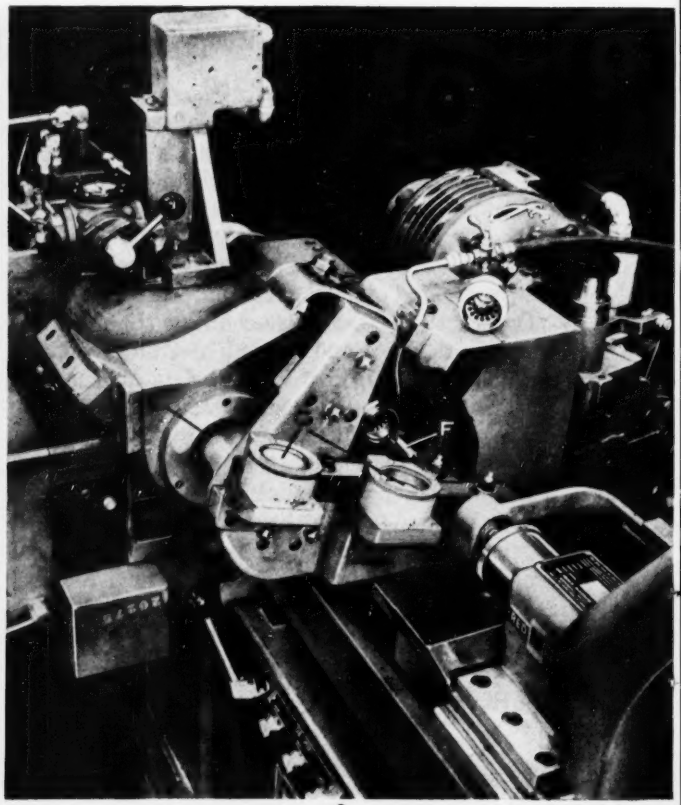


Fig. 3. In the operative position of the boring unit, the grinding table is locked out.



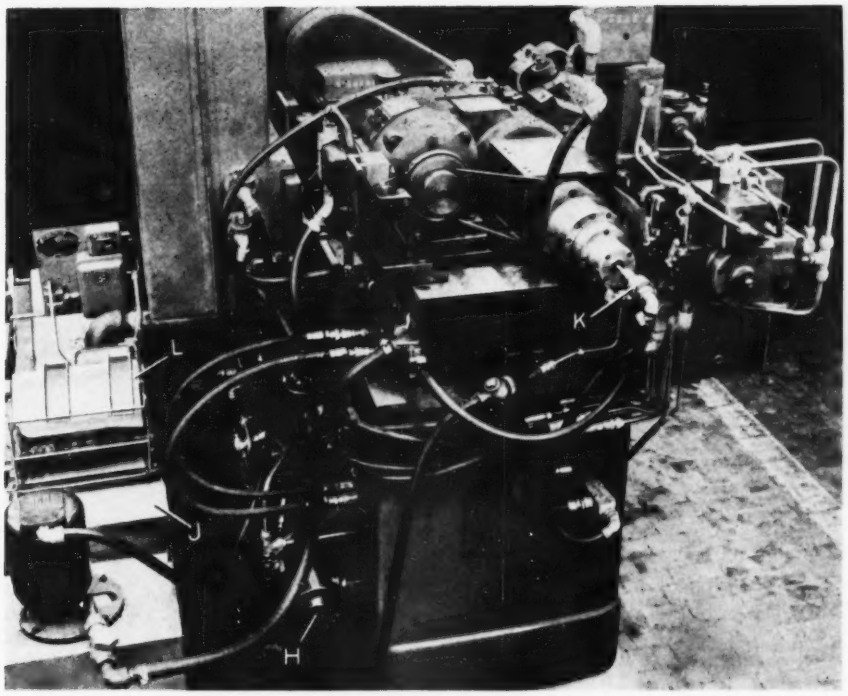


Fig. 4. The elaborate hydraulic and coolant systems of the machine are shown in this end view.

toward the center line of the work to operative position, which is illustrated. With the completion of the pivoting, a third limit switch sets up a movement of the arm toward the head of the machine at rapid traverse until the unit reaches the work. It then feeds under the control of a cam-operated valve at the rate of 0.002 inch per revolution of the work. Approximately 0.009 inch of aluminum is removed.

Both bearing seat surfaces of the housing are bored at the same time by single-point carbide tools supported from small boring-bars (only one bar *F* is visible in the illustration). The radial location of the tool points can be controlled by means of dial indicators *G*. Since the tools feed out as well as in, no dragline is left.

The cycle is completed by having the boring unit pivot to its raised position, illustrated in Fig. 2. Then, the arm retracts and the grinding table is unlocked. The complete machining time takes sixty-one seconds, with loading and unloading consuming an additional five seconds. Except for handling, the machine cycle is entirely automatic.

The end view, Fig. 4, shows the arrangement of the hydraulic and coolant systems. Oil from the pump *H* is directed to cylinders in the grinding table, wheel dresser, and boring unit. Coolant is obtained from a reservoir *J*, one line running to the exposed end of the work and another to a rotating coupling *K* in the hollow work-spindle.

The coolant drains through a Delpark filter *L*, shown in a close-up view, Fig. 5. Chips and swarf carried in the coolant are trapped on filter paper *M*. When they accumulate sufficiently to prevent the flow of coolant to the reservoir *J*, a float ball *N* is raised to energize a motor *O*. Through a gear reducer, the motor unrolls several inches of clean filter paper. The coolant is then able to drain, and the float drops and de-energizes the motor until clean paper again is required.

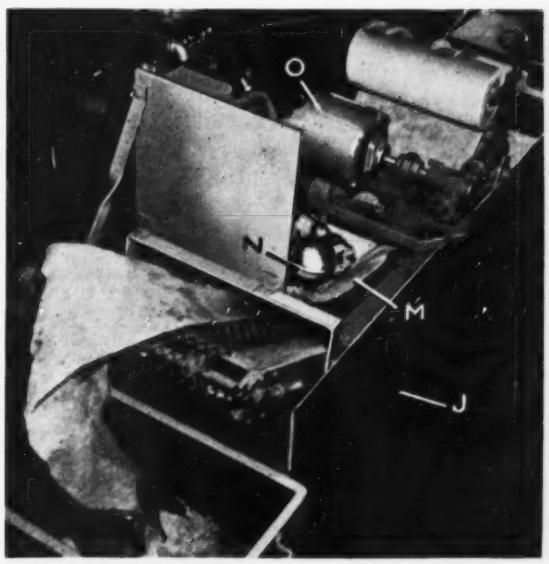
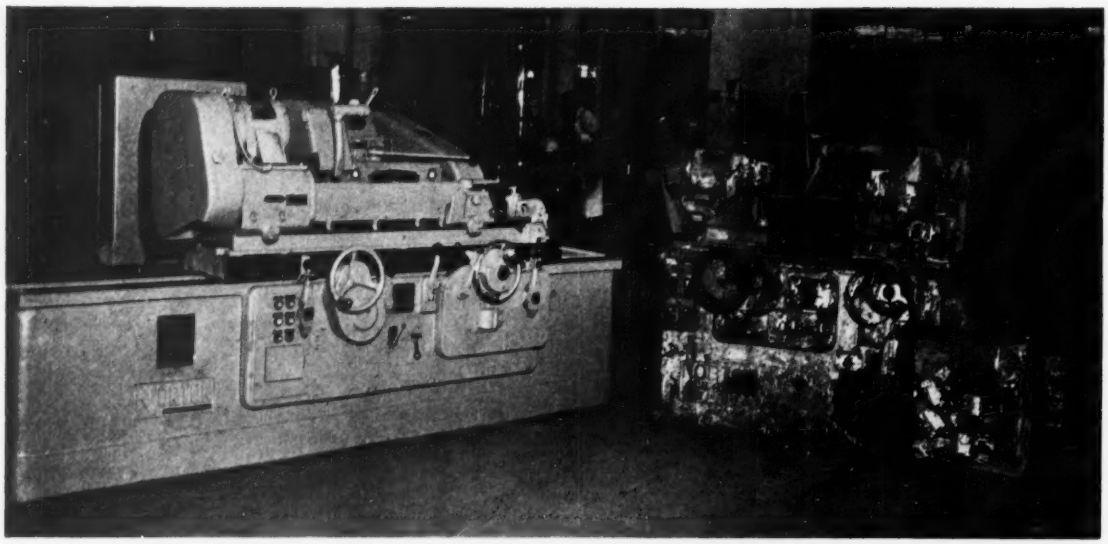


Fig. 5. Fresh filter paper is unrolled when the float ball is raised to energize the motor.



Machine Tool Builders Perform "Impossible" Salvaging Jobs

By Iver G. Freeman, Factory Manager
Grinding Machine Division
Norton Co., Worcester, Mass.

THE disastrous $50,000,000 fire on August 12, 1953, at the Livonia, Mich., Hydra-Matic transmission plant of the General Motors Corporation caused what was probably the world's greatest peacetime mass destruction of machine tools. Occurring when the automobile industry was operating at a near peak level, the task of resuming production was of the utmost importance.

No time was lost in enlisting the aid of the builders of the machine tools that were damaged. Equipment able to be salvaged was returned to the manufacturer or sent to a rebuilding concern. Authorization was given to work around the clock, if necessary, to return the machines to operating condition immediately.

Typical of the experience of many machine tool builders was that of the Norton Co. of Worcester, which received thirty-eight of its machines to be repaired. Of these, thirty-six were cylindrical grinders, one was a surface grinder, and one a vertical lapping machine. When received, they were covered with soot, burnt paint, and rust. Electrical panels were completely gutted by fire. Hydraulic tubing was bent and broken. Belts were completely gone. Electric motors were useless. Even the oil and coolant pumps showed evidence of the raging flames that had burned inside them. Many bases had cracks that were obvious even through the dirt that covered them.

When a thorough inspection of the first two machines received at Worcester showed that they could be restored to their original condition, speed of repair became the paramount concern. In fact, these first machines were shipped to the temporary quarters of the transmission plant set up at Willow Run, Mich., on September 21, only four weeks later, and about two weeks ahead of the date scheduled. The "before-and-after" condition of two of the machines can be appreciated from the heading illustration.

The economics of reconditioning the machines was not a factor; if it had been, the picture might have been quite different. General Motors needed these machines in a hurry, and they had to last a year or two until new ones could be ordered and built. The cost of repairing some of the worst damaged machines ran as high as 90 per cent of the replacement price. Six of the damaged machines were scrapped after inspection, principally because of old age and the at-

tendant difficulty of replacing items not available from present stocks.

Many of the parts removed from the machines were definitely scrap. In this category were wiring, motors, hydraulic tubing, ball bearings, sleeve bearings, nuts and bolts, pumps, sheet-metal parts, and belts. Machined components able to be reclaimed in most cases were bases, heavy castings, fabrications, feed-screws, spindles, control handles, hydraulic cylinders, valve bodies, and manifolds.

One of the most serious types of damage was the distortion of precision parts, such as the ways of bases and wheel-slides, feed-screws, and spindles. Ways that were distorted less than 0.005 inch were hand scraped to straightness. Ways with greater distortion first had to be replaned.

As might be expected, an intense fire of the type at the Livonia plant produced high stresses in the machine tools, evidenced by the many cracks in the castings. These were clearly visible after shot-blasting. Some bases had a dozen or more cracks requiring welding. Cracks in the smaller castings were not as prevalent, probably because of a more uniform heating of the small

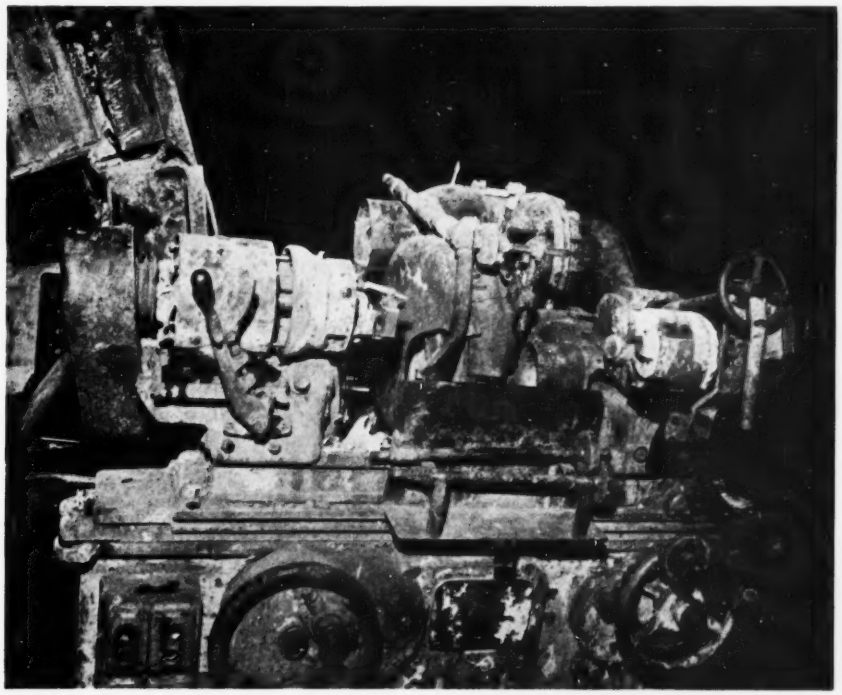


Fig. 1. Typical of the machine tools damaged in the fire, this grinder seemed destined for the scrap pile.



Fig. 2. The heat of the fire left no part of the machines unscathed. Burnt paint and soot cover this coolant tank.

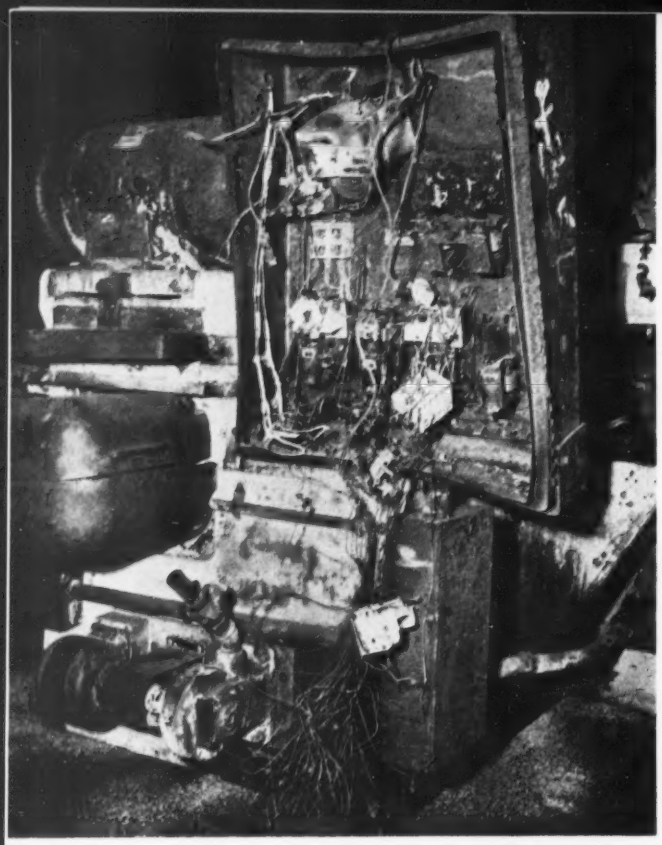


Fig. 3. Electrical panels, such as this one, presented the most hopeless appearance on many of the fire-damaged machines. Insulation was burned off and wiring was melted.

parts. It is interesting to note that none of the machines were condemned solely because of cracks.

First impressions on viewing the returned machines were discouraging. They seemed to have been objects of utter destruction. But once the burnt paint and soot had been steamed off, the task ahead seemed less insurmountable. This preliminary steaming made disassembly easier and cleaner. It also enabled cracks to be spotted more readily, so estimates of work required could be made early in the salvaging program.

There were many instances where hardened parts had been softened by the heat. In other instances, soft parts had been hardened, perhaps by a sudden quenching with a fire hose. Some parts were able to be salvaged by heat-treating. Others had to be discarded. Typical of these was a spindle that originally had been hardened to 42 Rockwell C scale. Inspection of the fire-annealed spindle showed that the hardness varied from 40 at one end to 36 at the other. Since the accuracy of the grinding machine depends in large measure on the condition of this spindle, it was decided to scrap this particular part instead of rehardening it and having to grind it under size.

Bearings of all kinds were 100 per cent casualties. Many ball bearings were "frozen." Bronze sleeve bearings had been warped by the heat and their physical characteristics also showed evidence of change.

Reconditioning followed a definite pattern. Preliminary cleaning with a jet of steam removed much of the soot, dirt, and burnt paint. Threaded members were coated with penetrating oil. Electric motors were shipped to their sup-



Fig. 4. After shot-blasting, cracks in castings were clearly visible. Circled with chalk for ease in spotting, the cracks were then routed and welded.



Fig. 5. Hydraulic manifolds, seen on the bench, were blackened and coated with a varnish-like deposit. They were cleaned with crocus cloth to insure proper fits without removing any stock.

plier for final disposition. The remaining electrical equipment and sheet-metal guards were stripped off.

The machines were completely disassembled and all parts were cleaned with solvents and wire brushes. Heavy castings were shot-blasted so that they were cleaned and relieved of stresses at the same time. Cracks were routed out and welded. Tables were scraped or ground to their original accuracy. Pneumatic cylinders were cleaned thoroughly, piston-rods were vapor-blasted, and all packing was renewed. Wheel-spindles, worms, and feed-screws were also vapor-blasted. All old tubing was used to pattern new lengths.

Salvaged and replaced parts were then assembled and inspected. When new motors and electric equipment were installed, the machines were tested. Painting and crating followed.

Norton, it will be recalled, had reason of its own to appreciate the impact of the catastrophe at Livonia. Only two months before, its new grinding machine plant had been hit by the country's worst tornado of the year. With the determination and unbounded help of contractors, other industries, and company personnel, the damaged structure was repaired in an amazingly short time. Norton's immediate salvaging experience then proved to be opportune in coping with the "impossible" G-M job.

Requirements for Producing a Jet Engine

It takes 8854 parts and eighty-seven different kinds of specialists performing several thousand engineering and precision manufacturing jobs to create one of the big jet engines that are employed to power America's latest model of military aircraft.

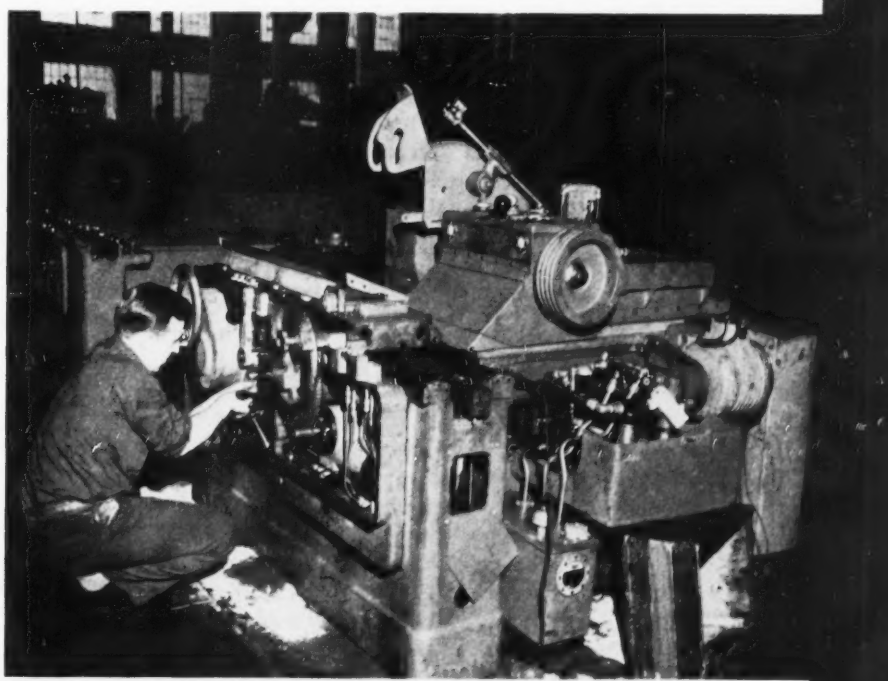


Fig. 6. Beginning to look like a grinder again, this machine was one of the first to be salvaged. It is shown at an advanced stage of reassembly.

Materials OF INDUSTRY

The properties and new applications of materials used in the mechanical industries

Aluminum Alloy Developed for the Aircraft Industry

An aircraft structural aluminum alloy, developed to provide an extruded alloy with good mechanical properties and corrosion resistance, has been placed on the market by the Harvey Aluminum Division, Harvey Machine Co., Inc., Torrance, Calif. HZM 100, as this alloy is called, makes it possible to effect a saving in weight since small cross-sectional dimensions of extruded shapes can be used in design. The resistance to corrosion, especially at high stress concentration areas, makes it useful for aircraft application.

Penetrant Dye for the Visual Inspection of Flaws

The detection of defects or flaws in metal, glass, and most plastic surfaces by the use of an inexpensive penetrant dye has been announced by the Met-L-Chek Co., Box 187, 121 N. Prairie Ave., Hawthorne, Calif. The dye and a developer, which are used in a convenient two-step process, are available in a kit called the Met-L-Chek Flaw Finder. That the dye has high penetrating powers is illustrated by the fact that it will seep through ordinary seals and any but perfectly soldered can seams. The dye is water washable. It is being employed for testing parts on conveyor belts in production line set-ups. Maintenance men also use it in checking gears, shafting, and castings for fatigue cracks, often without moving or dismantling the machine.

Beryllium-Copper Alloy with High Strength and Conductivity

A copper-base material of low beryllium content that combines properties of the high strength and the high conductivity groups of beryllium-copper alloys in use today has been brought out by the Beryllium Corporation, Reading, Pa. Beryldur, the name of this material, effectively fills the gap between the two groups, thus pointing to potential applications in the field now occupied by phosphor-bronze and brass.

Non-Shrink Laminating Resins for Tooling Applications

The availability of non-shrink laminating resins, Toolplastik L-900 and Toolplastik Gelkote L-910, has been announced by Rezolin, Inc., 5736 W. 96th St., Los Angeles 45, Calif. Tests indicate that the resins are neither corrosive nor brittle. They are easy to apply and cure at room temperatures. Special facilities and equipment are not required in their use.

Both resins were developed primarily for use with glass cloth reinforcing in such tooling applications as the fabrication of jigs and fixtures, models, prototypes, molds, and tool masters. Toolplastik L-900 is for standard laminating applications, while L-910 produces a high gloss surface on laminated tools.

Solvent Degreaser that Acts Fast and is Safe

A highly concentrated solvent for all degreasing and cleaning operations, which does not contain carbon tetrachloride or other toxic chlorinated solvents, is being produced by Brulin & Co., Inc., Dept. 295, 2939 Columbia Ave., Indianapolis 7, Ind. Brulin Solvent Degreaser, as it is called, acts and dries quickly, and may therefore be used on production lines where speed is essential. It is practically non-toxic and non-flammable, and does not require the use of special safety clothing or ventilating equipment. The degreaser has been used for cleaning electrical motors, having no adverse effects upon the electrical insulation.

Non-Flammable and Non-Volatile Paint Stripper

The removal of paint and synthetic resin coatings from production parts and work hangers can be accomplished by the use of a new non-flammable non-volatile paint stripper. Alk-A-Sol, as this stripper is known, was developed by the Whitfield Chemical Co., Dept. 15-B, 14225 Schaefer Highway, Detroit 27, Mich., for the removal of organic resin and pigmented coatings such

as baked enamels, varnishes, and lacquers from steel, zinc, and magnesium alloys. It is applied in steel tank baths in concentrations of from 25 to 100 per cent, and may be used in a temperature range of from 100 to 225 degrees F. Treated parts will rinse clean by spraying.

Welding Rod for Sealing Cracks and Building up Surfaces

A low melting point alloy welding rod, Eutec-Rod 115, that can be used on cast iron for sealing cracks and for building up worn and poorly machined surfaces where strength is not a factor, has been announced by the Eutectic Welding Alloys Corporation, 40-40 172nd St., Flushing, N. Y. This product is said to offer such advantages as low bonding heat, quick tinning action, long working range, and easy spreading. Although primarily designed for cast iron, it can also be used on bronze, on steel castings, and for filling and bonding any metal except aluminum and magnesium.

High-Purity Aluminum and Aluminum Alloys Introduced

The availability of high-purity aluminum and some of its alloys has been announced by the Fremson Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y. Some of the characteristics of Lurium, as this metal and its alloys are called, are a luster that is durable and non-tarnishing (produced as a result of polishing) ; a reflectivity of 83 per cent of a silvered mirror after polishing and anodizing; and an easy workability when using standard fabricating techniques. The accompanying table gives the composition and physical properties of this aluminum and its alloys—Types L, L5, L10, and L20.

Plastic Sealant for Impregnating Pressure Castings

A plastic sealant for impregnating pressure castings is being marketed by the Tincher Products Co., Sycamore, Ill., under the trade name Imprex. The new sealant is said to permanently seal excessive "leaker" and even "squirter" pressure castings. Upon hardening, a solid non-brittle bond is formed. It does not require any special handling or storage, and before hardening may easily be washed off with water.

Degreasing Agent for Use in Tumbling Mills

A soft, finely ground cellulose fiber material with high absorbency, called Cottentex, for use in degreasing and drying operations that employ tumbling mills, has been announced by the Cottentex Mfg. Co., 405Q E. Wells St., Milwaukee, Wis. Absorbing more than eight times its own weight, it does a fast, thorough job of absorbing oils, grease, or any liquid from metals, plastics, or any type of composition. The agent is particularly adapted for cleaning and degreasing ball, roller, and needle bearings, and any other parts that can be processed in a tumbling mill.

Silicon Containing Rust-Preventative Oil with Lubrication Qualities

A rust preventative that can be applied over a black oxide, phosphate, or other type of finish to impart good corrosion resistance is being made by the Mitchell-Bradford Chemical Co., 2446 Main St., Stratford, Conn. Siliconized Witch Oil, as this preventative is termed, exhibits water and moisture repellency and good lubrication qualities. It is used for protecting work in process and finished parts in storage.

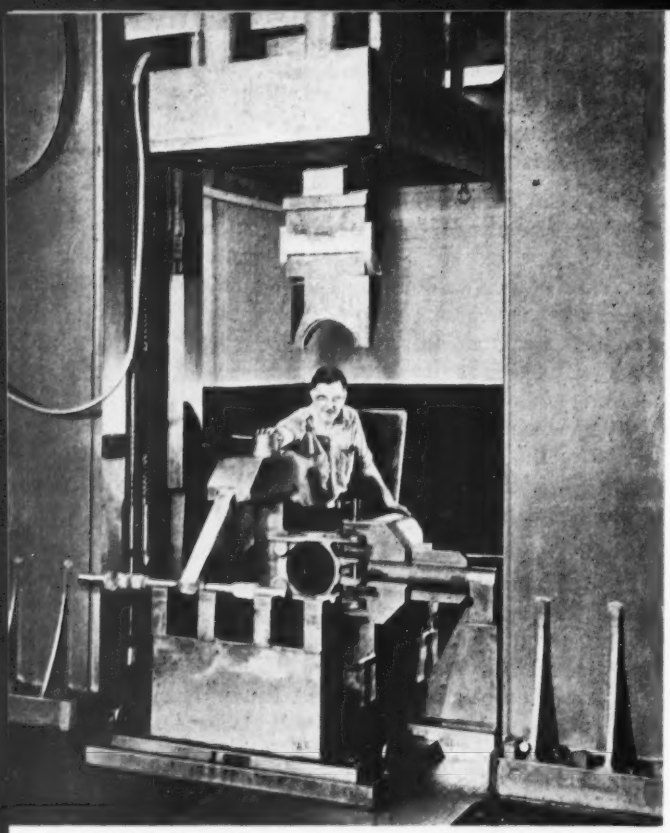
Composition and Physical Properties of Lurium

Alloy Designation	Composition Limits — Per Cent			Mechanical Properties				
	Aluminum	Magnesium	Other	Temper	Tensile Strength Pounds per Square Inch	Yield Strength 0.2 Per Cent Pounds per Square Inch	Elongation Per Cent on Ten Diameters	Brinell Hardness
LURIUM (L)	99.99	....	0.01 max.	Soft Intermediate† Hard	6,000 to 8,500 10,000 to 13,000 15,700 to 20,000	2,100 to 3,500 4,200 to 10,000 14,200 to 18,500	40 to 60 8 to 15 4 to 8	13 to 18 18 to 25 26 to 35
LURIUM 5 (L5)	*	0.4 to 0.6	0.02 max.	Soft Intermediate† Hard	10,000 to 14,200 15,600 to 21,400 23,000 to 27,000	2,800 to 5,800 14,200 to 20,000 21,300 to 25,800	20 to 40 6 to 15 2 to 6	22 to 28 35 to 45 40 to 50
LURIUM 10 (L10)	*	0.8 to 1.2	0.02 max.	Soft Intermediate† Hard	14,200 to 18,500 20,000 to 24,200 25,700 to 35,600	4,200 to 7,100 14,200 to 21,300 23,000 to 30,000	20 to 35 8 to 15 2 to 6	30 to 35 40 to 50 50 to 60
LURIUM 20 (L20)	*	1.5 to 2.5	0.02 max.	Soft Intermediate† Hard	21,400 to 28,600 30,000 to 35,500 35,500 to 50,000	7,100 to 14,200 25,800 to 32,800 34,000 to 45,500	20 to 35 6 to 15 2 to 5	40 to 50 55 to 75 70 to 80

*Balance 99.99 per cent pure aluminum †Choice of quarter hard or half hard material

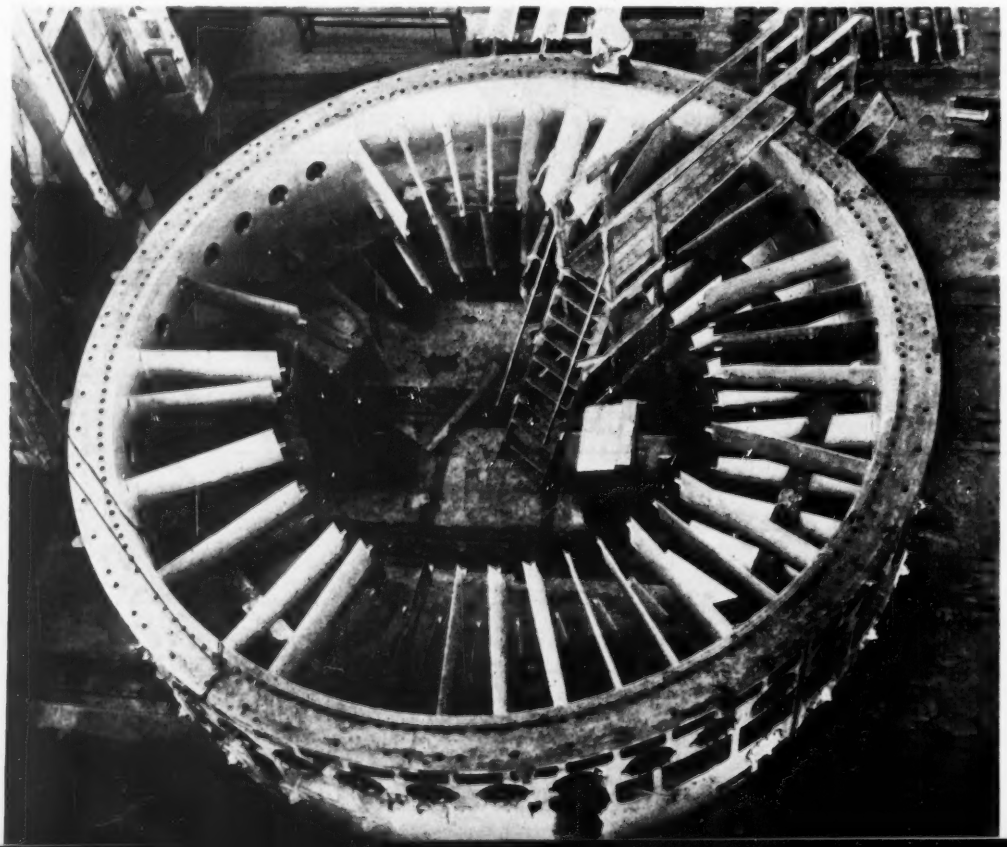
In Shops Around

Camera highlights of some interesting operations performed in various metal-working plants throughout the nation

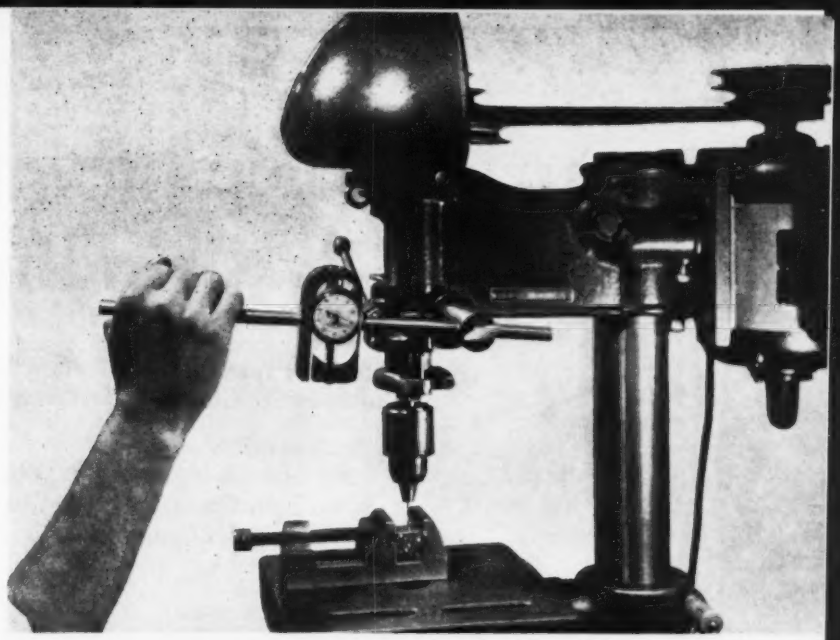


Subjecting landing-gear parts to bending loads up to 1,000,000 pounds at the Cleveland Pneumatic Tool Co., Cleveland, Ohio. The tests are made on flash butt welds that join tubing and forged sections. Upper members of the 28-foot high Baldwin-Lima-Hamilton machine shown perform tension tests on the floor above.

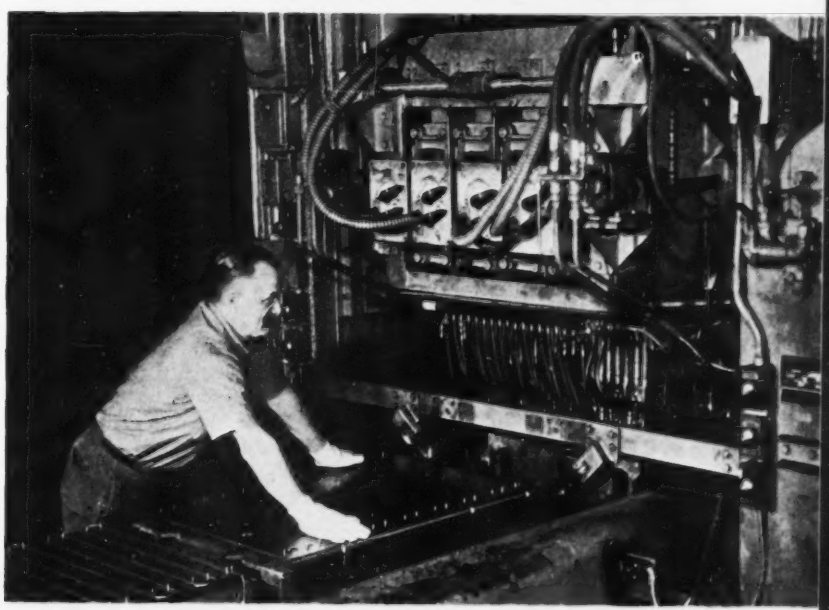
This giant ring is one of eleven similar rings carrying stator blades in five compressors being built in the Sunnyvale, Calif., plant of the Westinghouse Electric Corporation for the United States Air Force's wind tunnel at the Arnold Engineering Development Center, Tullahoma, Tenn. The blades are borne on bearings that are supported by granular flux-filled studs welded to the ring by the Nelson fastening process.



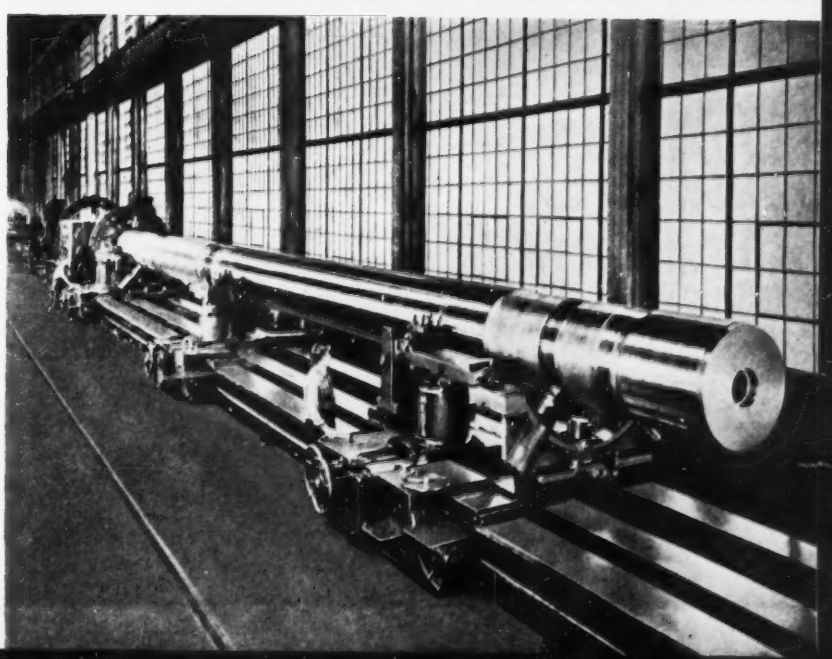
the Country



A Dillon pressure gage cuts production costs by reducing the amount of breakage of small drills and taps. In feeding the quill of the drill press, the operator also watches the gage dial so that the safe pressure limit predetermined for the particular operation is not exceeded.



The illustrated operation consists of completing 288 spot welds in progressive stages at the Nash-Kelvinator plant in Detroit, Mich. The multiple welder built by the Resistance Welder Corporation joins brackets and tubing coils to stack condenser panels.



A lathe operation on one of eight columns for a 50,000-ton hydraulic die-forging press being built at the Mesta Machine Co., Pittsburgh, Pa. The 500,000-pound, 76-foot long ingot is turned to a 40-inch outside diameter. Later, trepanning from both ends opens the bore to a 10-inch diameter.

Surface Tempering Caused by Grinding

Highlights of a Paper Presented before the Fall Meeting of the American Gear Manufacturers Association

By GORDON MURPHY, Vice-President
Foote Bros. Gear & Machine Corporation
Chicago, Ill.

HEAT generated during grinding operations can reduce the hardness of wearing surfaces and contribute to surface failures. When reduced hardness or residual stresses occur as a result of grinding heat in highly stressed areas, such as root fillets and involutes of gear teeth, fatigue failures may result. There have been many instances of service failures due to abnormal tempering on highly loaded gears in aircraft applications. This experience has ranged from sporadic failures to almost 100 per cent failure. In all instances, the same gears without abnormal tempering have shown completely satisfactory service life.

Changes in Microstructure Result from Generated Heat

There have been scuffing failures in spiral bevel gear applications as a result of tempering in tooth grinding, and fatigue failures in a highly loaded planetary transmission where severe tempering was the difference between success or failure. Until recently, few people recognized the fact that sufficient heat can be generated during the process of grinding to produce cracks or changes in microstructure. Such cracks can readily be found by magnetic particle inspection, but there is no generally accepted means of inspection for changes in microstructure and accompanying changes in hardness.

Dilute solutions of nitric acid have been widely used as an etchant of steel for microscopic examination. Martensite, the hardest microstructure, etches to a light gray color. Material that has been tempered to lower hardnesses etches to a color which varies roughly from a dark gray to black.

Some gears were etched all over to determine where significant tempering had occurred. Both very dark and very light gray areas were found. Sectioning the parts disclosed tempering in the dark areas as deep as 0.030 to 0.040 inch in the worst cases. The light gray areas were in all instances surrounded by dark tempered areas. The lighter areas were reformed martensite caused by heating the material above the critical temperature and rehardening it through the rapid dissipation of heat by the coolants and the cold mass of the piece.

Such conditions are intolerable, as tempering on involute surfaces of gear teeth contributes to premature failure. In root radii, where high stress concentrations occur, a soft tempered surface will reduce fatigue life. Rehardened areas, with accompanying high residual stresses, present an even worse condition with respect to fatigue life and, on involute surfaces, would aggravate pitting failures.

Several Factors Influence Grinding Results

To correct these conditions, work was checked at the plant subsequent to grinding operations. The following factors were found to have influenced the results:

1. Type of grinding wheel. (This includes grit, size, bond, etc.) Softer, more porous wheels were employed to eliminate surface tempering.
2. Coolant. Both oil and soluble oil coolants are used. Generally speaking, oil is used for tooth grinding operations, while soluble oil is preferred for external and internal grinding.
3. Wheel speed
4. Wheel feed
5. Uniformity of grinding stock. This includes considerations of distortion from heat-treating as well as size variations in gear-cutting or other machining operations that are involved.
6. Scaled or decarburized work. This tended to "glaze" or "load" the grinding wheel.
7. Human errors
8. Wheel sharpness. (a) Sharp diamonds and a fairly rapid traverse across the surface of the wheel were necessary to produce best results.

Dull diamonds and slow traverse tend to damage the grit and yield a duller wheel. (b) The amount of stock removed from the wheel is also important. A wheel that is frequently dressed and not abused can be redressed by removing from 0.002 to 0.003 inch. A badly glazed wheel may require the removal of 0.015 inch to get back to a free cutting condition.

The use of formed wheels, where contact area is large, presented the greatest difficulty in tooth grinding. Bore grinding and external diameter grinding presented few problems. Tooth grinding, free of surface tempering, was less difficult to achieve on machines that generate the tooth form with only line contact between the wheel and the work.

Etching of cracked pieces almost invariably disclosed that they were severely tempered or rehardened in the area in which the cracks occurred. Where no surface temper indications were found, it was assumed that the damage had occurred during the roughing passes and that further grinding had removed the signs.

Ultimately it was found necessary to set up etching facilities in the grinding departments and to completely etch the blanks subsequent to gear tooth grinding. All other grinding operations performed on hardened material were spot-checked. Solving the surface temper problem ended grinding cracks through the elimination of instantaneous heating which was accompanied by rapid expansion and contraction.

Air Units Speed the Assembly of Spark Plugs

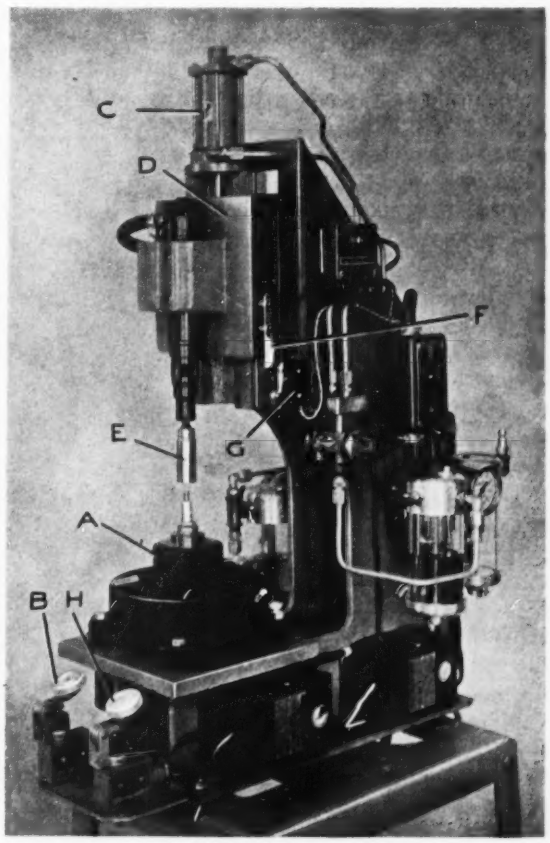
An ingenious combination of electrical and pneumatic devices is employed on the machine shown in the illustration to set the locking nut on Duchess spark plugs with a minimum of time and effort. This machine was designed and built by the Crusota Engineering Co., Springfield, Mo., using a number of standard air-operated units manufactured by the Mead Specialties Co., Chicago, Ill.

In operation, a spark plug is placed in the collet type work-holding fixture *A*. A main air valve (not shown) is opened to supply pressure to the pneumatic-operated collet. Then, the micro switch *B* is depressed momentarily. This contact shifts a four-way, double solenoid valve, and the double-acting air cylinder *C* lowers the dovetailed slide *D*, carrying the nutsetter *E* toward the spark plug.

Prior to engagement of the socket on the nutsetter over the hexagonal nut on the plug, cam finger *F* attached to the dovetailed slide trips micro switch *G*, thus energizing a two-way solenoid and supplying air to the nutsetter. Tripping of this micro switch also starts a timer motor.

The socket on the nutsetter is controlled by a built-in clutch. The timer motor is adjusted to admit air to the setter only for a sufficient length of time to throw the clutch. The solenoid controlling the air to the setter is then reversed by the timer, thus releasing contact pressure between the socket and the nut prior to upward travel of the socket.

Depression of the micro switch *H* shifts the four-way, double solenoid valve, and the double-acting cylinder *C* moves slide *D* up to its original position. Upward travel of the slide removes cam finger *F* from contact with micro switch *G*, thus de-energizing the timer motor and allowing it to be reset for the next operation. Finally, a bench valve is shifted to release the collet fixture. The complete cycle requires only three seconds.



Locking nut on spark plug is set in three-second cycle on this electrically and pneumatically controlled machine.

A.S.M.E. Annual Meeting Had a Record Number of Sessions

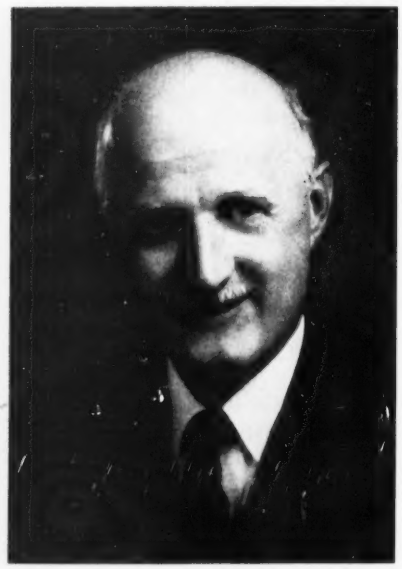
ENGINEERS from all over the country heard more than two hundred papers at the seventy-fourth annual meeting of the American Society of Mechanical Engineers, held in New York City from November 30 to December 4. There was a record number of sessions—113—for any meeting of the Society, and the interesting technical papers presented covered a wide variety of engineering subjects.

Philip M. McKenna, president of Kennametal, Inc., Latrobe, Pa., received the Holley Medal at the annual banquet for his "research, development, and application of cemented-carbide compositions which have contributed so much to the art and science of metal-cutting." Mr. McKenna, who is also national chairman of the Gold Standard League, was selected to deliver the Towne Lecture at the Society's annual meeting. This was the first time that the Holley Medal winner was also the Towne lecturer.

Three new awards established by the National Machine Tool Builders' Association were presented at the honors luncheon during this meeting. The Machine Tool Design and Economic Value Awards, made available in 1953 by this Association, are presented for the best three original papers submitted by members of the A.S.M.E. on the general subject of machine tool design and economic value.

Following a short address by Herbert L. Tigges, executive vice-president, Baker Brothers, Inc., Toledo, Ohio, and president of the N.M.T.B.A., the first Machine Tool Design and Economic Value Awards were presented to three men—Ernest Wildhaber, mechanical engineer at the Gleason Works, Rochester, N. Y., for his paper, "Manufacture and Application of Gleason Toothed Face Couplings and Clutches"; Robert R. Slaymaker, professor of machine design, Case School of Applied Sciences, and consultant for the Cleveland Graphite Bronze Co., Cleveland, Ohio, for his paper, "Bearing Design Using Concentric Journal Theory"; and Carroll R. Alden, research engineer, Ex-Cell-O Corporation, Detroit, Mich., for his paper, "Electrospark Machining."

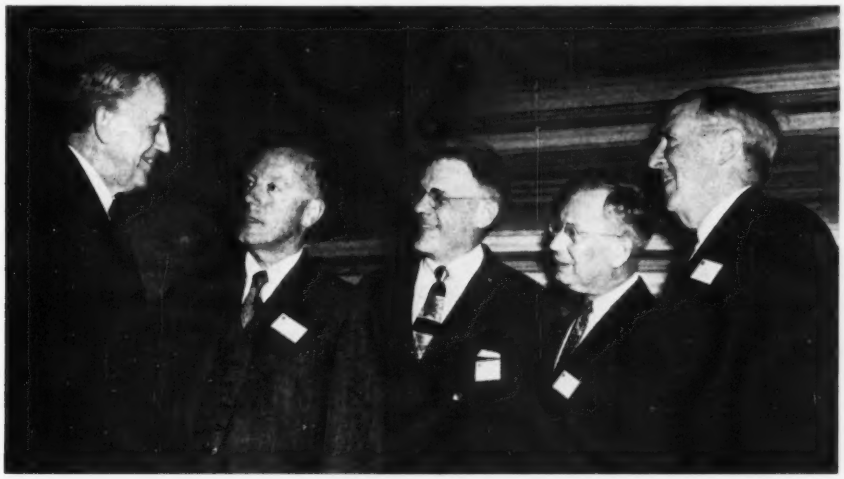
In explaining how the National Machine Tool Builders' Association came to set up the awards for the three best papers on machine tool design and economic value, Mr. Tigges said that the foundation of the machine tool builders' business is "better things for more people at lower cost." Pointing out that competition compels manufacturers to seek ways and means of reducing costs, he emphasized that the primary method of reducing costs is to increase productivity. Mr. Tigges stated his belief that the major factor in increasing productivity is better machine tools. He said, "Progress in the art of removing metal depends chiefly on the time and effort expended by engineers in research and development in this field." Accordingly, the Association is giving special attention and recognition to outstanding accomplishment in this field.



Philip M. McKenna, president of Kennametal, Inc., who was awarded the Holley Medal by the American Society of Mechanical Engineers. Mr. McKenna also delivered the Towne Lecture.

Earle Buckingham, professor emeritus of the Department of Mechanical Engineering, Massachusetts Institute of Technology, was one of the engineers chosen to represent the American Society of Mechanical Engineers as a lecturer. The subject of his lecture, "Dimensions and Tolerances for Mass Production," was the same as that of an extended series of articles currently appearing in MACHINERY.

Gwilym A. Price, president, Westinghouse Electric Corporation, Pittsburgh, Pa., presented the address at the annual banquet. In his talk, entitled "Engineering America's Future," Mr. Price urged engineers to play a greater role in public life and solving social prob-



Machine Tool Design and Economic Value Awards, established by the National Machine Tool Builders' Association, were inaugurated at annual meeting of A.S.M.E. (Left) Herbert L. Tigges, president of N.M.T.B.A., presented the awards. The three winners standing next to Mr. Tigges (left to right) are Ernest Wildhaber, Robert R. Slaymaker, and Carroll R. Alden. (Far Right) Tell Berna, general manager of the N.M.T.B.A.

lems. A. C. Monteith, vice-president in charge of engineering for Westinghouse, was awarded an honorary membership in the Society "for his leadership in planning engineering development and particularly for his influence upon the training of young engineers."

Among the many technical papers of especial interest to the metal-working industry were "Simplified Drafting Practice—A Modern Approach to Industrial Drafting," by Arthur H. Rau, manager, drafting, General Electric Co., Schenectady, N. Y.; "Operating Experience with a 14,000-Ton Hydraulic Extrusion Press," by Carl R. Anderson, assistant superintendent of extrusion plant, Aluminum Company of America, Lafayette, Ind.; "Economic Problems of the Automatic Factory," by Everett M. Hicks, manager and vice-president, Grinding Machine Division, Norton Co., Worcester, Mass.; "Recent Developments in Extrusion Techniques," by Heinrich B. Albers, chief engineer, Gerhard P. Krause, chief designer, and Arthur L. Greensite, design engineer, Loewy Construction Co., New York City; and "Controls and Safety Devices of Heavy Presses," by E. V. Crane, chief, special engineering, and William R. Jackson, development engineer, E. W. Bliss Co., Canton, Ohio.

Other metal-working papers presented were as follows: "Fundamental Factors in the Machining and Grinding of Titanium," by E. J. Krabacher, research engineer, and M. E. Merchant, assistant director of research, research department, Cincinnati Milling Machine Co., Cincinnati, Ohio; "On the Theory of Regenerative Chatter in Precision Grinding Operations," by Robert S. Hahn, consulting engineer, Heald Machine Co., Worcester, Mass.; "Testing Methods for Production of Accurate Machine Slide Ways," by George N. Levesque, director of research, Brown & Sharpe Mfg. Co., Providence, R. I.; and "Die Engineering," by Edward A. Reed, assistant chairman, industrial engineering, General Motors Institute, Flint, Mich.

Additional papers of interest were entitled "Evaluation of Bandsaw Performance," by L. V. Colwell, professor, production engineering, and R. E. McKee, associate professor, production engineering, University of Michigan, Ann Arbor, Mich.; "Machinability Research with J & L Tool Dynamometer on Titanium 150A," by Leif Fersing, experimental engineer, and David N. Smith, development engineer, Jones & Lamson Machine Co., Springfield, Vt.; "On the Drilling of Metals —Basic Mechanics of the Process," by Carl J. Oxford, Jr., research engineer, National Twist Drill & Tool Co., Rochester, Mich.; and "Cutter Life for Face-Milling Cast Iron," by W. W. Gilbert, professor, production engineering, O. W. Boston, chairman, production engineering department, University of Michigan, Ann Arbor, Mich., and H. J. Siekman, carbide design and application engineer, Carboloy Department, General Electric Co., Detroit, Mich.

As mentioned in September, 1953, MACHINERY, page 203, Lewis K. Sillcox, honorary vice-chairman of the board of the New York Air Brake Co., was elected president of the A.S.M.E. for 1954. The new president succeeds Frederick S. Blackall, Jr., who is also president and treasurer of the Taft-Peirce Mfg. Co.

INGENIOUS *Mechanisms*

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Safety Attachment Designed for a Reciprocating Movement

By L. KASPER

On a machine for producing a wire product, short lengths of wire are drawn into the machine from a magazine, moved in one direction for one operation, and then in the opposite direction for the next operation. Occasionally, a defective wire fails to release properly from the magazine, resulting in breakage. An attachment designed to eliminate jamming in cases of misfeed is illustrated in the accompanying drawings.

A plan view and front elevation of the attachment during normal operation are shown in Fig. 1. Rod *B* imparts a reciprocating motion to slide *A*, which carries the feeding mechanism, not shown. Part *C* is a U-shaped piece, with its open ends slotted and supported on a pin mounted in lugs on slide *A*. Part *D* is another U-shaped piece, also slotted in its open ends and supported on a stud in bar *B*. Welded to part *D* are two straps *E*, which support the closed end of part *D* on part *C*. Part *D* is free to slide within part *C*, and both parts *C* and *D* are free to slide on their supporting studs.

A spring *F*, nested in the hollow box section formed by the assembly of parts *C* and *D*, is under compression at all times, so that the closed

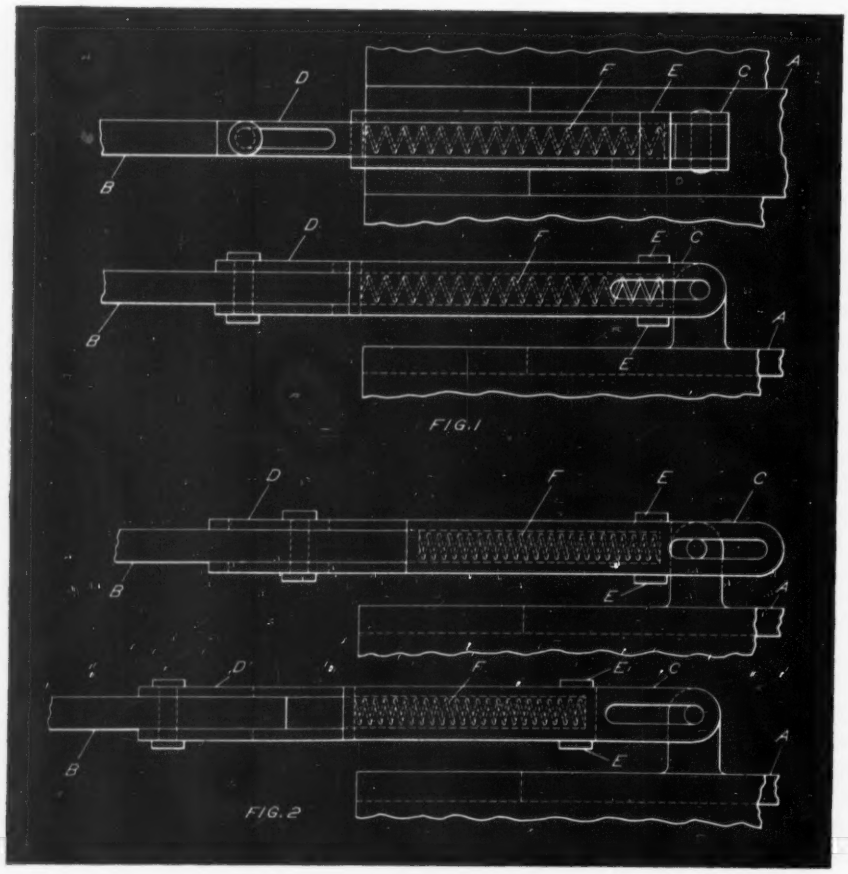


Fig. 1. Plan view and front elevation of attachment for eliminating jamming of the machine in the event of a misfeed.

Fig. 2. Operation of mechanism under abnormal conditions. When slide (A) is prevented from moving to right, part (D) contacts lugs on slide (A), as seen at top. When slide (A) is prevented from moving to left, spring (F) is compressed, as illustrated in the bottom view.

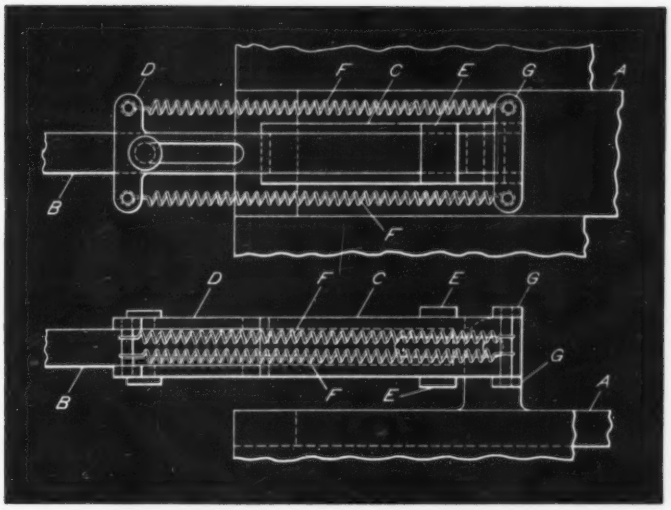


Fig. 3. Modified design of mechanism shown in Fig. 1, necessitated by space limitations that prevented use of long, strong spring.

end of part *D* is held in contact with the lugs on slide *A*. Also, the closed end of part *C* is held in contact with the right-hand end of bar *B*. In the position illustrated, which is normal operation, movement of bar *B* is transmitted to slide *A* through spring *F*. The tension of this spring, determined by trial, must be sufficient to transmit the required movement and still permit further compression without resulting in the breakage of parts.

The operation of the mechanism under abnormal conditions is illustrated in Fig. 2. In the view at the top, slide *A* has been prevented from moving to the right because of a defective wire failing to release from the feeding mechanism. As bar *B* continues its movement to the right, movement of part *D* is prevented by its contact with the lugs on slide *A*, and the stud in bar *B* slides in the slots in part *D*. Also, since the end of bar *B* is in contact with the open end of part *C*, movement of the bar causes this part to move with it, against the compression of the spring. Thus, part *C* slides over the pin mounted in the lugs on slide *A*. As bar *B* again moves to the left, the assembly returns to its normal position, as shown in Fig. 1.

If slide *A* is prevented from moving to the left with bar *B*, a condition such as the one illustrated at the bottom in Fig. 2 is produced. Bar *B*, in moving to the left, draws part *D* with it, thus compressing the spring against the closed ends of parts *C* and *D*. When the abnormal condition has been corrected, the parts again assume the positions shown in Fig. 1.

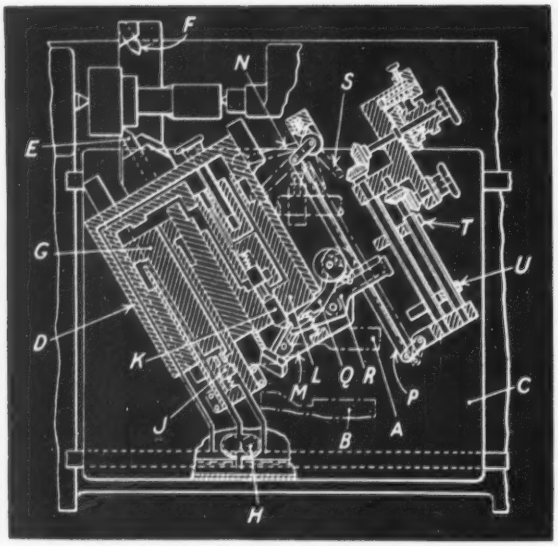
In a subsequent application of this arrangement having space limitations, it was impossible to provide an attachment long enough to accommodate a compression spring of the required length and strength. Consequently, the design was altered, as shown in Fig. 3, to permit the use of externally supported compression springs. In general, the design has not been changed except by the addition of side extensions on part *D*, and members *G* to part *C*, for attaching springs *F*. Operation is the same as in the original design.

Although both of these designs will perform equally well, the choice must be governed by space limitations, as the latter design will require greater width, as indicated by the plan view in Fig. 3. However, the fact that the springs are supported externally in this design may prove a definite advantage in that the tension may easily be adjusted to suit the requirements.

Hydraulically Operated Cross-Slide for a Copying Lathe

The hydraulically operated cross-slide for a copying lathe shown in the accompanying illustration is the subject of a patent recently issued in Switzerland. Two templates of the part to be turned, as indicated by the broken lines at *A* and *B*, are secured to a fixed member of the lathe, and this arrangement enables shoulders up to an angle of 90 degrees to be reproduced on both the headstock and tailstock ends of the work.

Saddle *C*, mounted on ways beneath the lathe centers, has angular guide ways on which the cross-slide *D* can be moved hydraulically toward and away from the work-piece. A tool-holder on the upper end of cross-slide *D* carries the cutting tools *E* and *F*. Tool *E* is used in conjunction with template *A* for turning stepped portions on the tailstock end of the piece. Tool *F* is employed, together with template *B*, when profiles are to be reproduced on the headstock end of the part. A bore is provided in cross-slide *D* to form a hy-



Sectional view of a hydraulically operated cross-slide for a copying lathe, employing two templates, (A) and (B), of the part to be turned.

draulic cylinder which surrounds the fixed differential piston *G* carried on saddle *C*.

In operation, saddle *C* is traversed on the ways, and oil is delivered to both sides of piston *G* by the pump *H*. The pressure in the lower end of the cylinder is maintained constant by a spring-loaded relief valve *J*. When cross-slide *D* is to be held stationary or moved away from the work axis, oil is permitted to escape from the upper end of the cylinder and return to the reservoir by way of the spring-loaded piston type valve *K* (fitted to body *L*), and through passages formed in the body and in cross-slide *D*.

Alternatively, when the cross-slide is to be traversed toward the work axis, valve *K* is moved downward by spring action so that the oil flow is interrupted and the pressure in the upper end of the cylinder is increased. Movement of valve *K* and, consequently, of cross-slide *D* toward and away from the work, is controlled by a stylus which engages template *A* or *B*. The stylus is pivoted on a pin fitted to the bracket *M*, the latter being attached to the lower end of valve body *L*.

Cutting tools *E* and *F* are brought into use, as required, by movement of a lever *N*, which together with its associated control mechanism, is carried on brackets on the cross-slide. When this lever is turned to its lowest position, bar *P* (connected to it and to a bracket at its lower end by swivel links) is caused to move in a curved path to the right. The arm *Q*, carried on a cross-pin fitted to the bracket *M*, is then swiveled by spring action so that a pin attached to it makes contact with the lever *R*. Lever *R* is carried on the same pin as arm *Q* and its left-hand end engages a slot in the stylus.

Due to the swivel action of arm *Q*, and consequently of the lever *R*, valve *K* is moved upward causing the cross-slide *D* to be moved away from the work. Thus, cutting tool *F* is brought into use, and the stylus makes contact with the template *B*.

Conversely, when lever *N* is set in its upper position, bar *P* moves to the left to engage a roller mounted on arm *Q*, thereby causing the pin fitted to the latter to be brought clear of lever *R*. Thereupon, valve *K* is moved downward by spring action with the result that cross-slide *D* is moved toward the work. In this way, cutting tool *E* is brought into use and the stylus engages template *A*.

If desired, cutting tool *F* can be automatically brought into use when the saddle reaches the extreme left-hand position by means of the lever *S*. This lever is mounted on the same spindle as lever *N* and is arranged to make contact with a horizontal adjustable stop (indicated by broken lines), whereupon bar *P* and the stylus mechanism are actuated. The sliding motion of saddle *C* is then reversed.

The movement of cross-slide *D* in each direction can be limited independently of templates *A* and *B* by the stops *T* and *U*. These stops are engaged by the right-hand end of lever *R* and can be adjusted toward and away from each other by handwheels, through bevel gears and screw systems. The handwheel controlling stop *T* is provided with a circular scale to enable parts to be turned by tool *E* without the need for a template.

Valve body *L* can be adjusted axially in a second bore provided in cross-slide *D* so that the distance between one of the cutting tools and the stylus can be set to produce stepped parts of the required diameters.

* * *

Mill to Roll Tapered Aluminum Sheet

A mill that will roll an aluminum sheet up to 11 feet wide, and tapering in thickness as much as 1/2 inch over its 40-foot length, is being installed by the Reynolds Metals Co. Rolling such an aluminum sheet is accomplished by an involved control system, built by the Westinghouse Electric Corporation, Pittsburgh, Pa., that rotates the screws to move the mill rolls up or down as the sheet passes through. The control must take into account the stretch in the housings and the distortion of the screws. Although each mill post has a sectional area of 8.3 square feet, the stretch is a few thousandths of an inch.

TOOL ENGINEERING *Ideas*

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Quick-Acting Milling Fixture for Square Bars

By ROBERT MERY, Staten Island, N. Y.

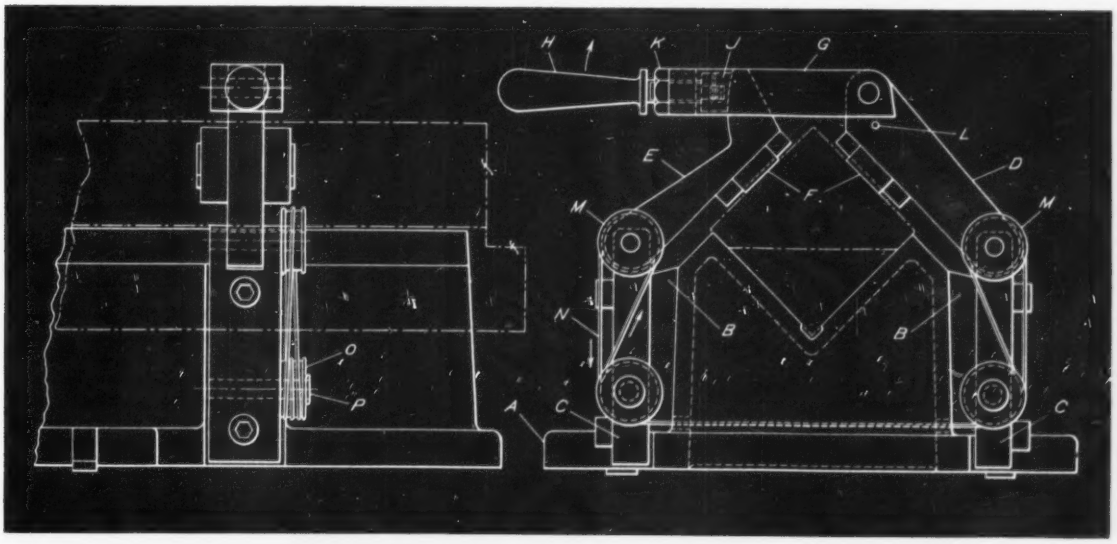
A work-holding fixture for a milling machine that is capable of being opened or closed in one motion has been designed for holding a 4-inch square bar. The fixture with a bar locked in place is shown by dot-and-dash lines in the illustration.

The main member is a bed casting *A* which has a 90-degree vee machined across its top surface into which the bar is placed for support. Two lugs *B*, one on each side of the bed casting and integral with it, provide mounting faces for two cold-rolled steel fork brackets *C*. Cap-screws are employed to secure the brackets to the lugs. The work is held firmly in place by means of two clamping levers *D* and *E* which pivot on pins pressed into the fork brackets. Both levers have enlarged clamping faces provided with leather strips *F* to prevent damaging the work surface.

A fork-shaped operating lever *G* pivots on the upper end of lever *D*. Handle *H*, which is a commercial product, is threaded to engage the operating lever, and is turned down for attaching to a hardened cam-block *J*. The cam-block is a movable unit that fits loosely within the fork, and is attached to the handle by means of a groove and pin. A cam shape is machined on the end of lever *E* to engage with a corresponding surface in the cam-block. By this means, the necessary clamping pressure can be exerted on the work. The screw thread on the handle, in conjunction with check-nut *K*, makes it possible to adjust the applied pressure.

To reload the fixture, the handle is moved in the direction of the arrow in the illustration. The back end of the operating lever *G* makes contact with stop-pin *L*, after which both clamping lever *D* and operating lever *G* swing clear of the work. At the same time, the opposite clamping lever *E* also pivots clear of the work due to the action of cable *N*.

The synchronized movement of the second clamping lever is obtained by means of six pulleys in addition to the cable. Pulleys *M* are keyed to the two lever shafts. The cable is fastened to each of these two pulleys to prevent slippage.



A milling fixture for square bars on which a pulley and cable system enables fast loading and unloading.

Four idler pulleys *O*, mounted in pairs on the two stationary studs *P*, rotate in opposite directions with the movement of the cable.

Fixture for Cropping Split Rings from Coiled Wire Stock

By W. M. HALLIDAY, Birkdale, Southport, England

A simple punch-press fixture makes possible an interesting method for mass-producing small split rings. The part, which is shown in Fig. 1, is made of 0.032-inch diameter tempered steel wire. It is used in another component, being accurately seated in an angular groove. A key is a close fit in the 1/4-inch split area and serves to keep the ring from turning in the groove.

The quantity of rings involved proves impractical for production by means of a hand-operated bending fixture, where straight lengths of wire are formed singly. Also, trial rings so produced showed considerable variations, both in diameters and in the width of the split area.

In the procedure followed at the present time, the wire is first wound into a series of 3-foot long coils in a lathe operation, much in the manner of winding a spring. By using a mandrel of the appropriate size and by applying adequate braking pressure during the winding, the inside and outside diameters of the coils are closely controlled. Then, in a punch-press operation, the split rings are formed by feeding the coils into the cropping fixture shown in Fig. 2. Twenty rings are formed simultaneously, approximately 1100 being produced from each coil length.

The fixture is designed for use on a bench type press of about 2 tons capacity. Baseplate *A*, secured to the press platen, supports body block *B*. A transverse bore *C* in the block retains a hardened steel horn *D* having a series of step diameters visible in the sectioned end view.

At its front, the bore is 0.005 to 0.008 inch greater in diameter than the outside diameter of the ring, so that the coils enter freely. For the same reason, the diameter of the horn in the front portion of the bore is chamfered and made a similar amount less than the inside

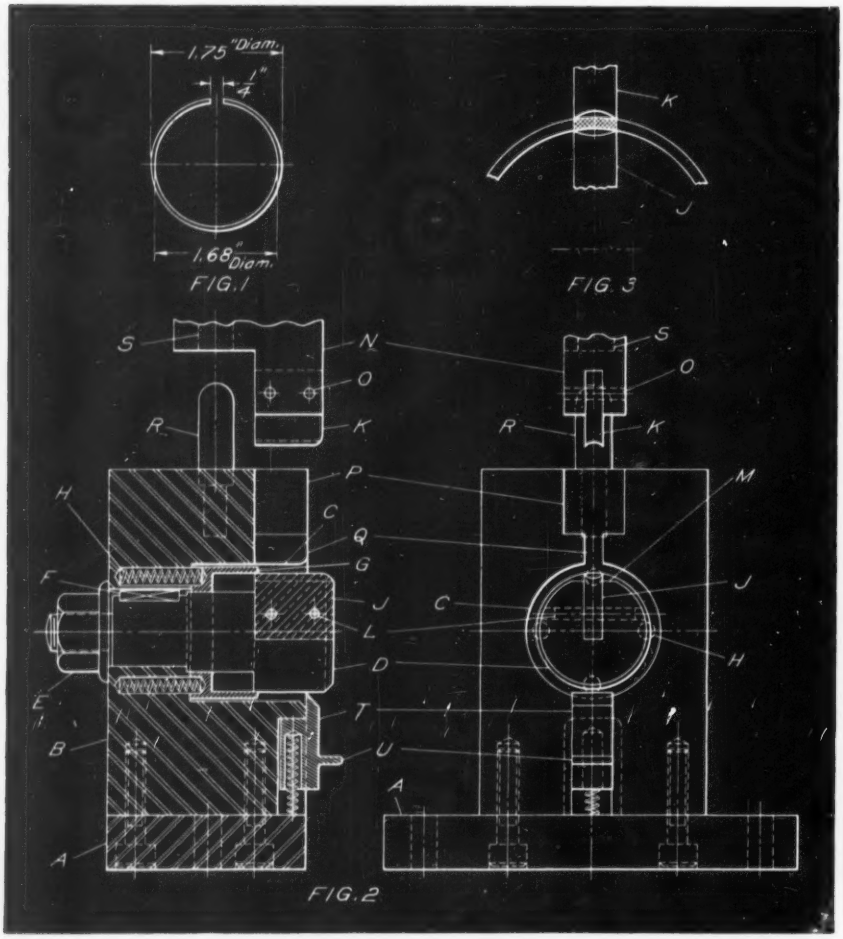


Fig. 1. This split ring is wound in multiple and then severed in a punch-press operation. Fig. 2. Coils of wire are fed over the horn (D). Twenty split rings are produced in each cycle of the press. Fig. 3. The blades have to penetrate the surface of the wire only slightly to obtain clean breaks.

diameter of the ring. To secure the horn in the bore, the small end of the horn is threaded and engages a lock-nut *E*. A key *F* holds the horn from rotating.

Mounted over the middle portion of the horn is a sleeve *G*, which is a sliding fit with the bore. Essentially, the sleeve is an ejector for the rings; when a coil is fed over the horn, the ejector retracts against the pressure of four springs *H* located in blind holes spaced radially around the rear of the bore.

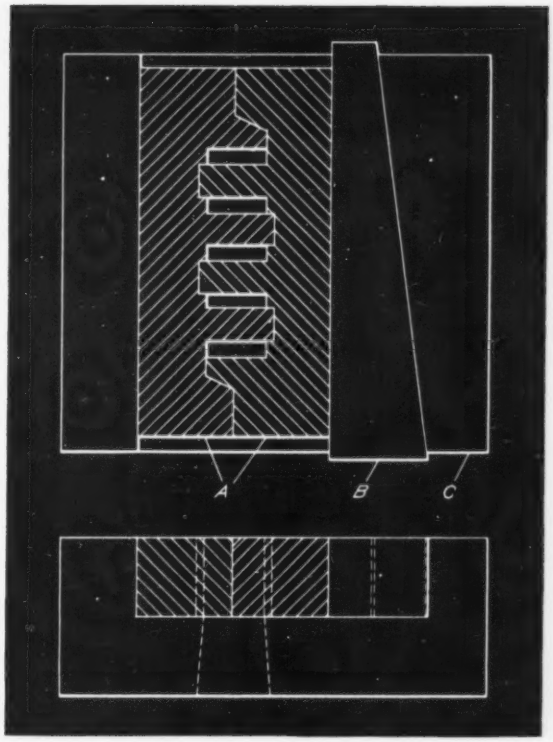
Cropping of the split area is by the action of a lower blade *J* and an upper blade *K* opposing each other in a vertical plane. The lower blade, 1/4 inch thick, is a press fit in a slot cut axially into the front of the horn. Pins *L* give the blade a positive location and are removable so that the blade can be reground. The front end of the blade is finished flush with the horn. A shallow flat *M* along the top of the horn forms clearance for the cutting edges.

Immediately above the block and on the center line of the horn, an L-shaped punch-holder *N* retains the upper blade, also 1/4 inch wide, in a slot, where it is located positively by pins *O*. On the down stroke of the press ram, the vertical leg of the punch-holder bottoms in a channel *P*, with which it is a sliding fit. At this point, the upper blade has passed through a second channel *Q*, 1/4 inch wide, and has penetrated the surface of the wire sufficiently to cause it to sever. The punch-holder is held in front-to-rear alignment with the block by engagement of a rounded pillar *R* in a hole *S*.

The closed position of the blades is shown in Fig. 3. Actually, the upper blade *K* has to penetrate only 0.010 to 0.012 inch, and the lower blade *J* only half that amount, to obtain clean breaks in the wire. The concave faces of the blades prevent any deformation of the ring and also reduce the pressure required for the cropping operation.

A finger *T*, Fig. 2, beneath the horn holds the coil in position for cropping. When feeding a coil onto the horn, the finger is pushed down by the thrust of the coil against the beveled tip of the finger. Also, the sleeve *G* is pushed back against the pressure of the springs *H* to a shoulder in the bore of the block. The finger is then permitted to rise, and the beveled tip enters between two adjacent windings of the coil.

When the press ram descends, the entire length of the coil on the horn is punched simultaneously and is converted into twenty split rings. To remove the completed rings, the finger is manually depressed by means of an integral projection *U*, and the sleeve *G* springs forward to eject the work.



Sectional die consisting of identical die members designed to simplify machining and alignment

Die with Two Identical Members to Simplify Machining and Assembly

By FEDERICO STRASSER, Santiago, Chile

The many advantages inherent in dies of sectional design are known to tool engineers and toolmakers. Sectional dies, however, have two drawbacks, the necessity of correct alignment, and the difficulty of locking the die sections together. Nicked cutting edges and even broken die members result from misaligned or inadequately locked die sections.

In one particular case, five narrow slots were to be punched in a part. It would have been difficult to construct a solid die for this job. The die shown in the illustration presented a simple solution of the problem. It consists of two identical sections *A* so designed that both could be machined together. This feature considerably reduced construction costs, and at the same time permitted proper alignment without the need for dowel-pins or other similar locating devices. The projecting portions of each section matched exactly the corresponding recessed portions of the opposite section. A wedge *B*, driven into a tapered channel machined in the face of the die-shoe *C*, was used to secure the two sections together.

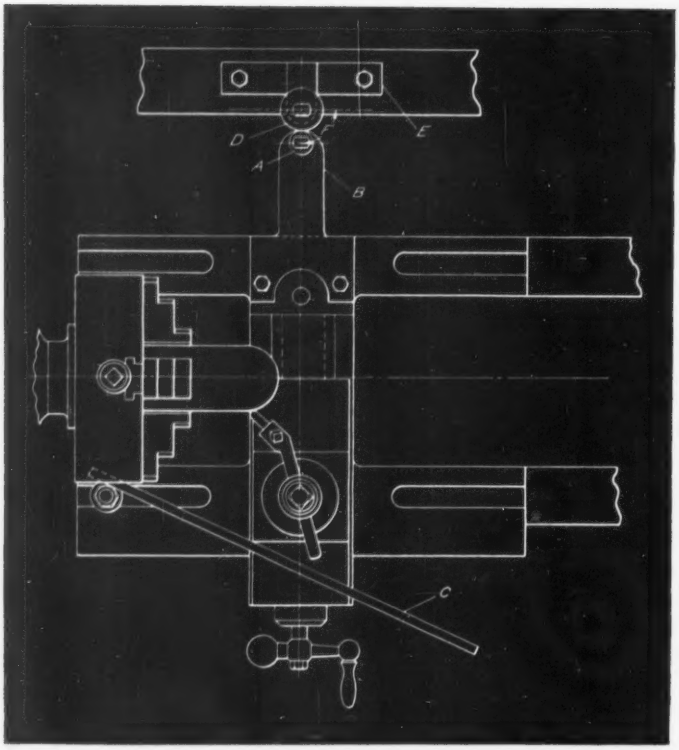


Fig. 1. Simple arrangement devised for turning a ball on a cylindrical part.

Lathe Attachment for Machining a Spherical Punch and Die

By RALPH T. STEWART, Winston-Salem, N. C.

A simple device for machining a spherical punch and die, of particular interest to the shop with limited facilities, is shown in the accompanying illustrations. The ball shape is obtained by forcing the cross-slide to follow the radius of a stationary guide roller as the carriage is fed lengthwise with the tool bit in contact with the work piece.

The cross-feed screw-nut must be loosened to permit the cross-slide to function independently. Roller *A*, Fig. 1, which acts as a follower, is mounted on bracket *B*. This bracket is bolted to the cross-slide. Bar *C*, which is independent of the lathe, is used to force follower *A* against guide roller *D*. Bracket *E* supports roller *D* and is itself fastened to the taper attachment. If the machine has no taper attachment, a special bracket can be provided on the lathe bed.

As the carriage is fed toward the headstock, follower *A* traces a path around a 90-degree arc *F* of the guide roller *D*. Care must be taken to stop the feed as the cut becomes tangential with the cylindrical portion of the work so as to avoid necking. The radius of the hemisphere formed on the end of the work is equal to the sum of the radii of rollers *A* and *D*.

The mating die for the punch is formed in the opposite manner. It must be remembered, however, that the die will be formed to exactly the same radius as the punch; and if clearance is required between the two spherical surfaces, guide roller *D* must be made correspondingly larger. In forming the die, follower *A* traces a 90-degree arc *G* on the left-hand side of the guide roller instead of on the right-hand side, as is the case in turning the punch.

* * *

Total taxes accrued in the retail price of a typical 1952 car were four times greater than in a corresponding 1939 model.

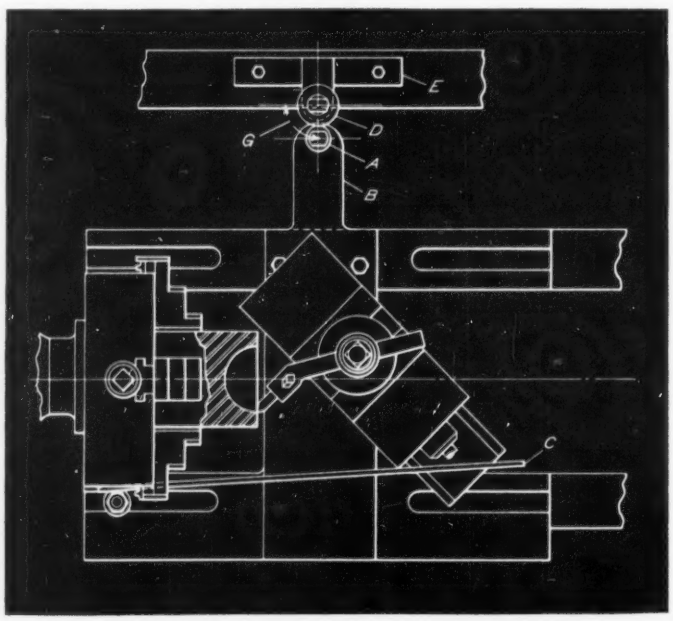


Fig. 2. The compound rest is positioned off-center and at an angle for machining the spherical die cavity.

Automated Assembly of Aircraft Engines

On a progressive, automated assembly line at the Wright Aeronautical Division of the Curtiss-Wright Corporation, production of Turbo Compound aircraft engines can be increased 250 per cent in a floor space 42 per cent less than that formerly employed.



(Above) Automatic machine for tightening bolts on the front cam section of Turbo Compound aircraft engine. Identical torque is applied to each bolt.



(Left) Turbine wheel nut is automatically tightened on this machine. Three power recovery turbine wheels are used on each Turbo Compound to increase power 20 per cent.



Conveyors move pistons and cylinders to engine assembly line. Operators at right are installing front row pistons and cylinders, while those at left install same parts on rear row of engine. Machines index engine assemblies and rotate propeller shaft to facilitate installation of pistons and cylinders.



The Sales Engineer and His Problems

By BERNARD LESTER
Management Consulting Engineer
New York

A Dynamic Equipment Replacement Policy

IF you listen to industrial leaders in their talks and interviews, you hear them repeatedly telling us that the future state of business will depend more and more on effective selling. Some even exclaim that "sales people must rediscover the lost art of salesmanship."

This may well apply to retail selling, for in our everyday shopping we see glaring examples of indifference and impoliteness. Often, when we are anxious to buy, we actually have to sell ourselves and our need in order to get sales service.

As sales engineers, we do much more than exchange the wrapped item for the money. We analyze technical problems. We tirelessly develop customer relations. We sell results. But there is one phase of our work, however, that we often neglect. It is selling the prospect the wisdom of an adequate Dynamic Equipment Replacement Policy.

The New Year is a mighty good time to select some one thing of importance that will mark what we do during the whole year. What we suggest is promoting among our customers and prospects the wisdom of analyzing the efficiency of each piece of equipment according to an established pattern, and in the light of what is available in the way of improved equipment.

Without considering plant expansion, we all know that there is available to machinery builders many years of solid work just to bring manufacturing operations up to possible present-day efficiency. Large and successful machinery users have a plan of replacement. It is based on evaluating each item upon a system of depreciation and a monetary reserve for modern equipment. But the medium-sized and small manufacturers, unconscious of the need, drift along with the use of machinery that is "eating its head off." Many such companies only apply a lump-sum depreciation charge to equipment in general.

We vividly recall walking through the shop with the president of an old Pennsylvania concern. He stopped to gloat over a machine tool fifty years old. His men had remodeled it—somewhat crudely—to perform a new function. What pride over the ingenuity displayed! But when we questioned this top official on the cost of making the change, he said: "It cost nothing. My men did it in their spare time." When we suggested the loss in even having such a machine around his shop—the expense in setting up and operating time, the inaccuracies in work compared to a modern machine, and the fact that it was a laggard in production—he was surprised. His reply was, "Why that machine has been charged off years ago."

The point, of course, is that he was unable to realize how much it cost him just to have the machine around. He had no conception of the advantage of a Dynamic Equipment Replacement Policy applied to every machine in his shop.

There are certain hurdles we sales engineers have to overcome in selling our prospects on the desirability of a Dynamic Equipment Replacement Program:

1. Getting familiar with current programs stripped of too much intricate detail. Large metal-working manufacturers have experts, formulas, and plans which we must accept. But there are many prospects we can help without a life study of the subject.

2. Reaching the prospect's management, making them conscious of the need, helping them to help themselves. Shop men and purchasing engineers usually follow some plan determined by those higher up.

3. Selling the advisability of a plan. This requires continuous sales effort of an idea, rather than a machine. It resembles selling an accounting system, a pension plan, or group insurance

for employes—a feat almost never accomplished in a single visit.

In order to overcome these hurdles, we ourselves have to be enthusiastic over the long-range results of such promotion. In cases where a business-building sales engineer converted a customer management to a Dynamic Equipment Replacement Program, a careful review was made of the operating efficiency of every piece of equipment in the plant, in the light of new equipment. These studies resulted in a harvest of orders. How about sales engineers adopting this slogan for 1954—Sell a Dynamic Equipment Replacement Program!

Vacuum Impregnation Curtails Rejects of Magnesium Castings

MAGNESIUM gear-box castings that withstand the exacting requirements of jet-engine operation are being made for A. V. Roe Canada Ltd., by York Gears Ltd., Toronto. Thanks to impregnation of the castings in vacuum equipment, very few castings are rejected. This means a considerable saving in time and labor, and proportionately higher production.

The impregnant used for correcting porosity in these castings is Permafil 3255, a synthetic thermosetting resin developed by the General Electric Co.'s plastics department and supplied in Canada by Canadian General Electric Co., Ltd. Castings come to the impregnating process directly from the foundry after the removal of flash metal. Unless they are oily or greasy they do not need preliminary cleaning. If necessary, however, this is done by a pass through a vapor type degreaser which takes only thirty seconds.

The castings are then loaded individually into a Stokes vacuum impregnating chamber. The castings vary in size, and from fifteen to one hundred pieces may be treated in a single batch. The chamber is sealed and subjected to a vacuum of from 27 to 29 inches of mercury for one hour to remove virtually all the air from the pores.

The supply line from the impregnant storage reservoir is then opened and Permafil is drawn into the chamber by the vacuum, until the impregnant covers the castings completely. The vacuum is maintained for a half-hour, then it is broken and air is introduced until a pressure of 100 pounds per square inch is built up. This pressure is maintained on the surface of the impregnant for an hour to speed up the process. The return line to the impregnant reservoir is then opened and the air pressure reduced to 5 pounds per square inch, which is sufficient to drive the excess Permafil out of the impregnating chamber and back to the storage reservoir.

Impregnating tank and castings are thus drained of Permafil. The castings are then cleaned in a lukewarm water solution containing a mild detergent at a temperature of 120 degrees F., which removes any excess plastic on the surface of the castings. The castings are then rinsed in clear water at the same temperature, and placed in a curing oven where they are baked for one hour at 200 degrees F. to thoroughly set the plastic. Total time for impregnating each batch of castings is five and one-half to six hours.



Large castings like this magnesium gear-box housing are placed individually in the vacuum impregnating chamber; smaller castings can be handled in perforated metal baskets.

LATEST DEVELOPMENTS IN *Shop*

Snyder Automatic Car-Wheel Boring and Facing Machine

An automatic two-spindle vertical indexing type machine for boring and facing hubs on railroad car wheels has been announced by the Snyder Tool & Engineering Co., Dept. M, 3400 E. Lafayette, Detroit 7, Mich. One advantage of this special machine is its capacity for performing both the boring and facing operations in the same machine. By combining these two operations, the amount of handling required to process large, heavy cast-iron railroad car wheels is substantially reduced.

The machine has three major components: a vertical spindle column for the facing operation, shown in Fig. 2; a boring-head, seen in Fig. 3; and an indexing turntable, illustrated in Fig. 1. These components are mounted on a welded-steel base that is rigidly braced and normalized. During the facing operation, a hydraulic draw-bar operates the cross-feed on the vertical spindle through a rack-and-pinion arrangement. Four carbide-tipped tools—two round tools for roughing and two square for finishing—are used on the boring-bar. This arrangement permits the roughing and finishing work to be done simultaneously.

The unique indexing mechanism, which has three work-holding positions 120 degrees apart and rotates three times during the machining cycle, is an example of the successful application of automation. Wheels are loaded into and unloaded from the front position with a two-tong hoist. The wheel blanks rest on locating seats. The actual loading and unloading work takes place while the facing and boring operations are being

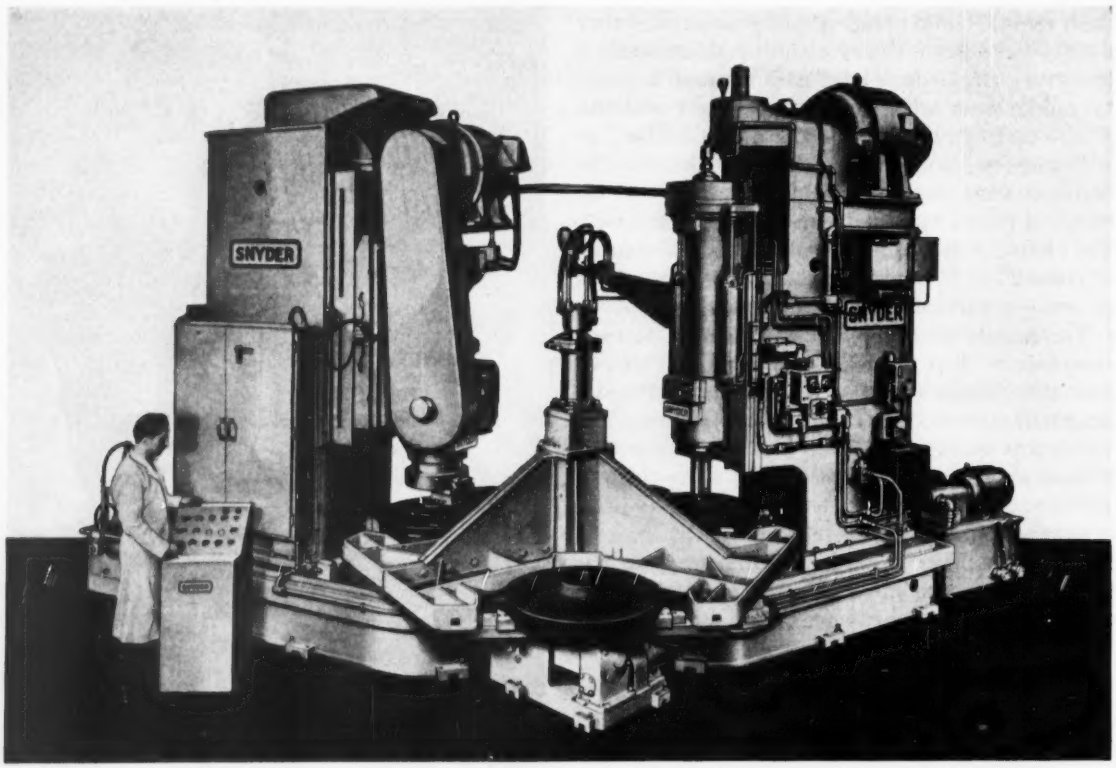


Fig. 1. Snyder vertical index boring and facing machine for processing railroad car wheels

Equipment

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON

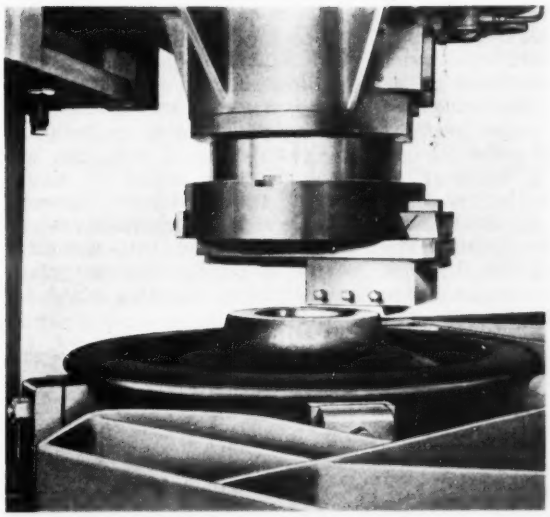


Fig. 2. Close-up view of vertical spindle tool and chuck used in the facing operation on machine which is illustrated in Fig. 1

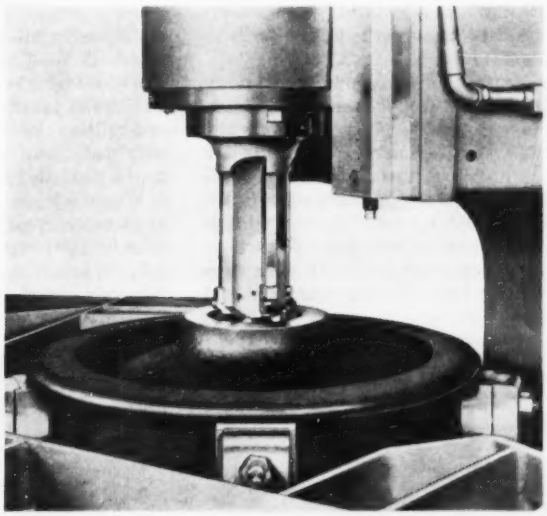


Fig. 3. Tool with four carbide tips, two round for roughing and two square for finishing, used on the boring-bar of Snyder machine

performed on the other two wheels. During the operation of the machine, the wheel blank is rotated 120 degrees, from the load-unload position at the front of the machine into the facing position. Here, the indexing mechanism lowers the wheel into the chuck, and the jaws clamp the part in place. As the spindle rotates, the facing cutter is drawn over the wheel blank into the cut.

The jaws open on completion of the facing cut, the indexing mechanism lifting the wheel clear of the chuck and rotating it to the boring position, where it is lowered into another set of jaws and clamped in position. The boring-bar makes its pass through the hub, roughing and finishing at the same time. When the cuts are completed, the jaws open and the wheel is lifted and rotated to the unload position.

The machine is equipped with a remote control panel. In normal operation, the operator pushes a cycle-start button which automatically sets up the machining cycle, including indexing, clamping, cutting, unclamping, and transferring the part to the next work position. To facilitate set-up and the making of test cuts, each motion in the cycle can be run individually when the operator so desires.

With a surface speed of 260 feet per minute and a feed of 0.045 inch per revolution, the machine cycles thirty-three times per hour. The machine cycle time for boring and facing wheels with a 6 3/4-inch bore 7 inches long is one minute twenty-five seconds.

Welding Rod for Manganese Steel Castings

A manganese-nickel steel welding rod for repairing or building up worn or broken manganese steel castings is announced by the Wall Colmonoy Corporation, Dept. M, 19345 John R St., Detroit 3, Mich. The material is called "Walmang," and has been developed to provide an austenitic manganese steel welding rod that produces weld metal having the same manganese content, work hardenability, and wear resistance as cast 12 per cent manganese steel.

This welding rod can be applied as a weld deposit for repairing or salvaging a wide range of manganese steel castings commonly specified by the railroad, mining, cement, construction equipment, and steel industries. It can also be used as weld metal to attach cast replacement wear parts to manganese steel castings.

Heavy-Duty Schiess Gear Hobbers

Gears up to 23 feet in diameter can be cut on the largest of four new Schiess Model RF precision gear hobbers being introduced in this country by the Kurt Orban Co., Inc., Dept. M, 205 E. 42nd St., New York 17, N. Y. These machines incorporate a fixed table capable of supporting gear blanks ranging from 20 to 80 tons. A moving column is adjustable both for the diameter of the gear and the depth of the tooth. The hob saddle, carrying the swivel-head, travels on the vertical ways of the column and is balanced by counterweights to permit cutting in either direction.

Spur gears are cut by driving the work-table through index change-gears connecting with the hob spindle drive. The master worm-wheel, which insures accuracy of the indexing movement, is rotated by two worms with a common drive which are placed opposite each other. Tooth pressures of the two driving worms offset each other so that no lateral stress is exerted on the table mounting.

In cutting single helical gears, or double helical gears in which the teeth are separated by a gap, the additional movement of the table required to produce the correct spiral angle is brought about by means of a differential gear provided with change-gears. Herringbone gears are cut with end-mills. The standard hob spindle is replaced by one for end-mills, and the drive is changed by moving a lever from the hobbing to the single indexing mechanism. A second lever initiates the indexing, which is then accomplished automatically by a separate motor. The additional table motion needed for end-milling herringbone gears is obtained from the same change-gears used in helical hobbing.

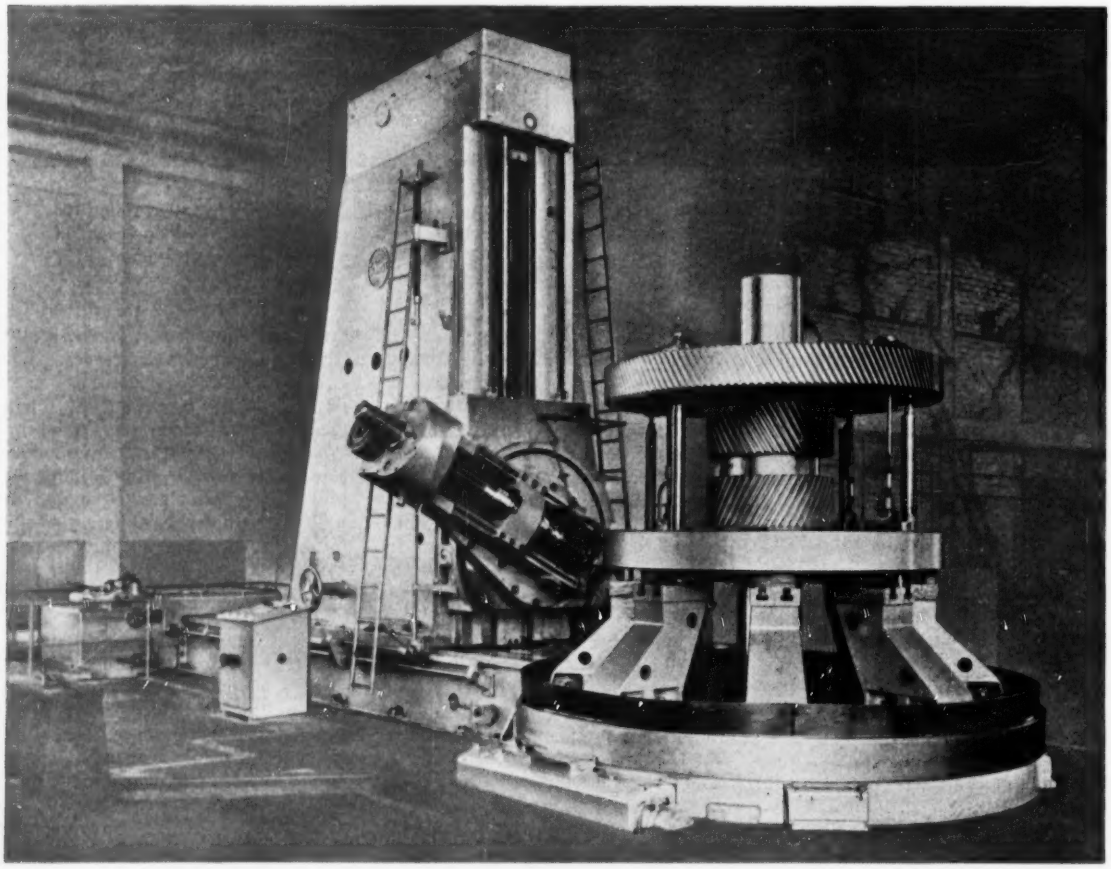
Worm-wheels with low lead angles are usually cut with parallel hobs by the radial feed method. The column is advanced, with the work rotating, until the correct center distance between wheel and worm is reached. For high lead angles, worms must be cut with tapered hobs and axial feed.

Formed milling cutters and the single indexing method can also be used on spur and helical gears. Special formed milling cutters or end-mill attachments permit the cutting of internal gears.

Vari-Tool Finisher

The Vari-Tool Finisher produced by the Standard Electrical Tool Co., Dept. M, 2500 River Road, Cincinnati 4, Ohio, combines a roughing wheel and a finishing belt in one unit. This machine offers an advantage to small and medium shops for grinding high-speed steel or carbide tools. The solid-carbide platen permits the micro-finishing of end, top, and side clearance angles on single-point tools without diamond wheels or highly skilled operators.

The left-hand side accommodates a 6-inch diameter plate-mounted cup grinding wheel for



Schiess gear hobber, distributed by the Kurt Orban Co., Inc., shown cutting 14-foot diameter gear



Grinding wheel and abrasive belt combined in a single unit by the Standard Electrical Tool Co.

the roughing operation. The wheel is protected by an adjustable steel guard. On the right-hand side is a compact assembly which includes three pulleys to accommodate a 54- by 4-inch abrasive belt, and also a steel guard.

Each side of the machine is equipped with a 10- by 7-inch tilting table with a graduated indicator. A 3/4-H.P., 3600-R.P.M. motor is operated by a forward-off-reverse switch.

Hydraulic Feed for Punch Presses

Jaco Devices Inc., Dept. M, 97 High St., Hingham, Mass., announces the introduction of an automatic coil and strip stock feed having new design features which permit it to be used over a wide range of punch press applications. This feed will be marketed in the United States and Canada under the trade name of "Hydrafeed." It is operated and controlled by hydraulic oil, which directly couples the rotation of the crankshaft to the reciprocating feed table.

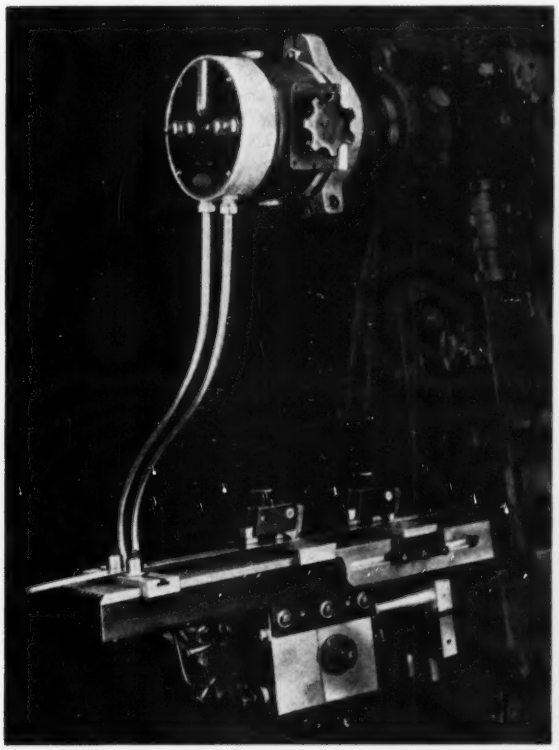
The slide table is equipped with open-side gripper boxes which permit easy loading of either coil or strip materials. By reversing the grippers, the feed can be used to either push the material through the dies or pull it through by gripping the salvage material. Adjustments are provided to raise or lower the feed table within a range of 4 inches to maintain the strip center line level with each press tool. The table can be moved away from, or up to, the die set within a 6-inch range.

The feed is made in two sizes. Model A has a maximum feed stroke of 6 inches and will handle material up to 6 inches wide by 3/32 inch thick. Model B has a maximum stock feed stroke of 12 inches and will feed stock up to 12 inches wide by 3/32 inch thick.

Precision Flat Lapping Machine

A precision flat lapping machine designed to perform work to close micro-inch finish tolerances is announced by the Spitfire Tools Co., Dept. M, 2931-35 N. Pulaski Road, Chicago 41, Ill. This machine —called the Spitfire "24"—is adapted for finishing metals, glass, quartz, plastic, and other materials requiring exceptionally flat and smooth surfaces. Such pieces as sliding or rotating parts, gages, air-tight or liquid-tight seals and valves, measuring devices, load-carrying bearings, plastic and die-casting molds, and drawing dies can be lapped.

The working height of the lapping plate is 38 inches. The plate is 24 inches in diameter, 2 inches



"Hydrafeed" hydraulic stock feed for punch press



Lapping machine announced by Spitfire Tools Co.

thick and is made of close-grained cast iron, heat-treated and designed to prevent distortion. It is precision-finished and supported by six ball bearings. The lapping surface has an Archimedean spiral groove. The aluminum gear-box encloses bronze gears that are permanently lubricated and sealed. The machine occupies a floor space of 25 by 25 inches, and is provided with a heavy-duty ½-H.P. motor.

Cro-Plate Wet-Blasting

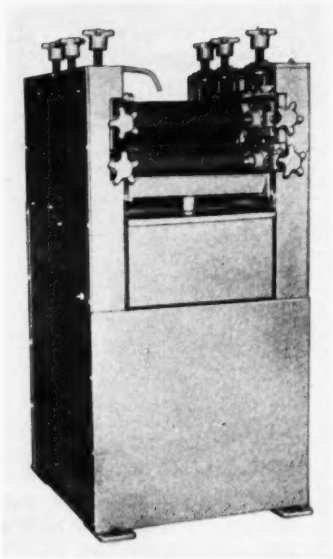
The addition of a new model to its line of wet-blasting equipment has been announced by the Cro-Plate Co., Inc., Dept. M, 747 Windsor St., Hartford 5, Conn. Known as the "Pressure Blast Roto-Barrel," this unit was designed for high-production finishing, cleaning, or deburring of parts such as screw machine products; small stampings, castings, and extrusions; and precision machined components. The work is loaded into an expanded-metal barrel and rolled into the interior of the cabinet. Here an adjustable blast gun is aimed in the open end.

A variable-speed drive rated at 0 to 78 R.P.M. rotates the barrel exposing the parts to the blast stream. Following the wet-blasting operation, the barrel is manually rolled out of the cabinet and the work is rinsed free of abrasive slurry at the machine. Two blast circuits are available—either regular velocity, which works on the aspiration or suction principle, or high velocity, which operates on the pressure tank system.

Coiled-Stock Coating Machine

A machine for applying drawing compound to both sides of coiled stock has been developed by the Union Tool Corporation, Dept. M, Warsaw, Ind. This machine automatically feeds the material from the uncoiler, deburrs the edges, coats both sides with drawing compound, and feeds the press. It is equipped with four sets of rolls. The first set of rolls is of hardened and ground steel and serves to deburr the sharp edges. The second is of the rubber-covered nip type which feed or withdraw the coiled steel from the uncoiler; the third, doctor rolls, of ground chromium-plated steel; and last, a set of smooth-ground, rubber-covered coating rolls.

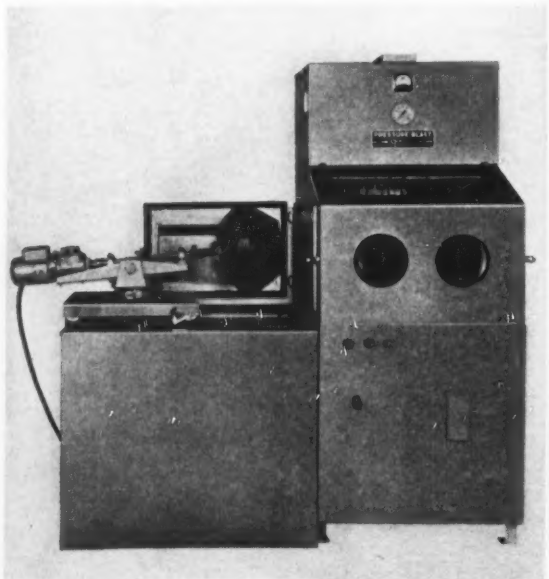
A circulating pumping unit with a 5-gallon sump tank supplies the drawing compound to the doctor and coating rolls. Calibrated handwheels provide the means for adjusting the doctor rolls in and out against the coating rolls to permit accurate control of the thickness of the coating. The machine is equipped with a 1-H.P. motor. These machines can be built to handle stock up to 60 inches in width and any thicknesses from 0.005 inch up. A machine taking stock up to 10 inches in width is 43 1/4 inches in height, 24 inches wide, 18 3/4 inches deep, and weighs 750 pounds.



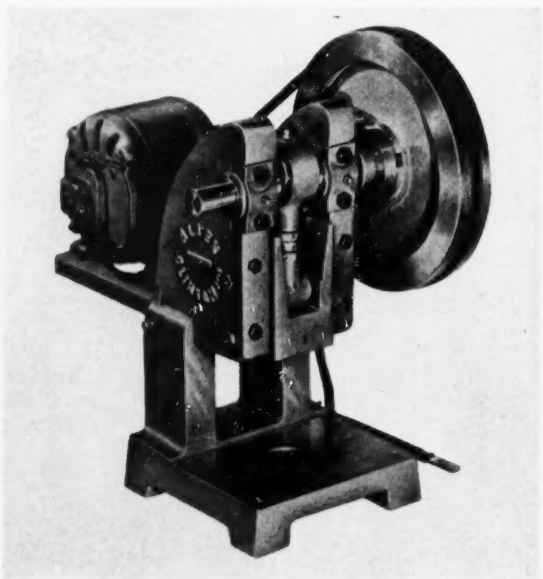
Machine for coating coiled stock with drawing compound brought out by the Union Tool Corporation

Bench Model Punch Press

A bench model 1-ton punch press developed by Alva F. Allen, Dept. M, Clinton, Mo., is particularly suited for short runs or small work. Its use frees heavier equipment for larger production runs.



Cro-Plate "Pressure Blast Roto-Barrel"



Allen bench model 1-ton punch press

One of the features of this press is a new single-pin clutch that gives positive clutching action and is operated by a convenient hand-lever. The ram of the machine is designed for accurate adjustment and reciprocates on machined ways. A gib is provided for taking up any wear. The press is operated by a direct V-belt drive.

In continuous operation, the press has a maximum capacity of 200 operations per minute. Punches and dies can be made cheaply and, in instances where only a short run is necessary, tools can be made of cold-rolled stock.

"Speedy-Cut" Metal-Sawing Machine

"Speedy-Cut," a 6- by 6-inch capacity metal-sawing machine, has been added to its line by the Peerless Machine Co., Dept. M, 1600 Junction Ave., Racine, Wis. It is a two-speed machine designed for general-purpose use. A broad-shouldered U type over-arm retains the saw blade between special flat steel blade-holders. Adjustable gibs on the top and side of the saw frame guide compensate for wear.

One feature of this machine is a trip-switch that automatically stops the motor, disengages the feeding mechanism at the completion of each cut, and allows the frame to raise to its starting position. Other features include a centrifugal coolant pump and large vise jaws. The rear vise jaw can be set at the required angle, to which the front movable jaw automatically adjusts itself. A compensating feeding mechanism automatically adjusts itself to the size and shape of the work. For finer adjustments and varying pressures, the saw is provided with a feed-adjusting handwheel, a pressure indicator, and a graduated scale that can be quickly read by the operator. A two-speed V-belt, driven by a 3/4-H.P. motor, is controlled by a step sheave.

Brinell Hardness Testing Machine

A production model Brinell hardness testing machine, designed to fit directly into a conveyor system, is announced by Steel City Testing Machines, Inc., Dept. M, 8817 Lyndon Ave., Detroit 17, Mich. This machine is an adaptation of the company's hydraulically operated direct-reading type of tester. A feature of this equipment is a roller conveyor arranged for use in conjunction with the anvil of the tester. The "anvil" itself consists of a series of hardened steel bars. Between these bars are the conveyor rollers. These are automatically lowered and raised during the testing cycle. The machine is of the motor-driven, hydraulically operated type.



Brinell hardness testing machine for production line announced by Steel City Testing Machines, Inc.

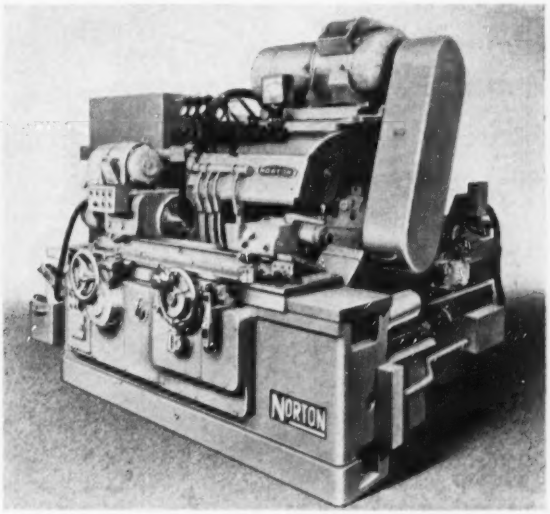
Norton Multiple-Wheel Grinder

Multiple diameters on parts such as transmission and motor shafts can be plunge-ground simultaneously on the semi-automatic grinding machine built by the Norton Co., Dept. M, Worcester 6, Mass. Several wheels, 36 inches in diameter, may be carried on the spindle body to a maximum span of 30 inches including spacing collars. Rugged construction of the wheel-head, which moves on widely spaced 74-inch long ways, contributes to fast grinding action, fine finish, and excellent wheel life.

The cartridge type bearings that support the wheel-spindle



Peerless two-speed metal-sawing machine



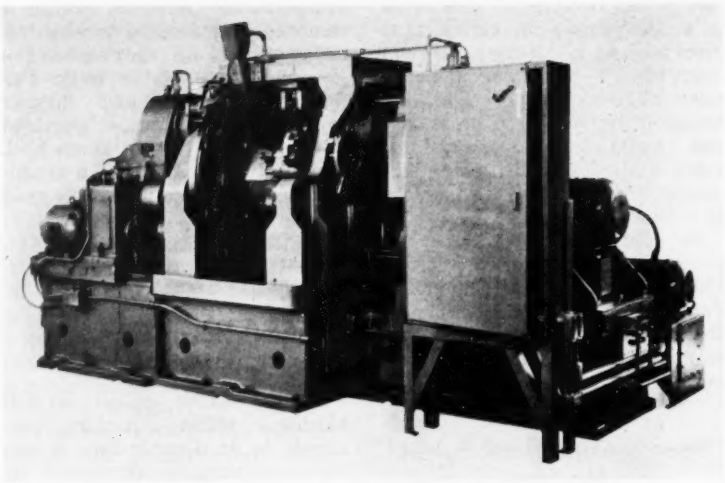
Norton semi-automatic multiple-wheel grinder

facilitate grinding wheel changes. When the need arises, the wheel-spindle and its bearings are removed as a unit. Bearing adjustments are not disturbed.

A hydraulically operated wheel truing device, consisting of individual truing units for each grinding wheel, is mounted on the wheel-slide. A diamond in each truing head is pre-set to a master gage, and truing of all wheels is done simultaneously as the device is traversed a distance equal to the widest wheel in the set up.

Compensation for wheel diameter reduction is automatic. The wheels are adjusted toward the work the same distance as the diamonds are fed into the wheels during truing. Compensation for variation in individual diamond wear is accomplished by push-button control for feeding the truing heads individually toward the wheels before retruing.

An automatic grinding cycle includes work and coolant control, rapid wheel-head advance, grinding feed, dwell, and rapid return. The cycle operates under electrically timed control, but a selector switch for optional manual control is provided. Hydraulically operated steadyrests are available where needed. These rests require minimum attention as their action is interlocked with the automatic grinding cycle. The machine has been designed to permit automation arrangements when desired. A built-in swarf remover is also available.

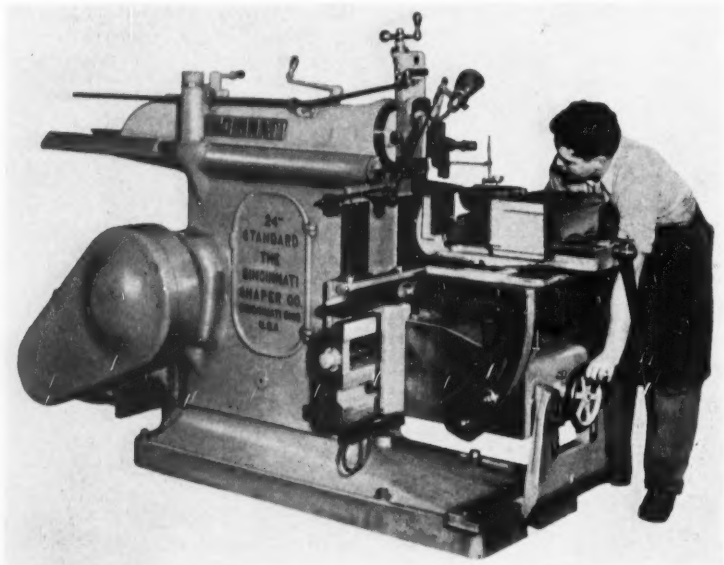


Horizontal hydraulic feed machine for processing tractor rear axle housings built by Moline Tool Co.

Special Moline Machine for Processing Rear Axle Housings

A special, horizontal hydraulic feed machine that drills, spotfaces, counterbores, taper reams, and taps tractor rear axle housings has been built by the Moline Tool Co., Dept. M, Moline, Ill. A power-indexing, trunnion type fixture with one loading station and four working stations holds the work. The machine is designed to accommodate housings of either right- or left-hand design. This is accomplished by providing additional spindles at various positions so that tools may be repositioned.

A push-button station mounted on the side of the control enclosure serves to control the machine through an automatic, electrically controlled operating cycle. With the work properly clamped in the fixture, the operator presses the button to start the cycle which includes rotary indexing of the fixture; and rapid forward traverse of the tapping head unit, the right-hand drill and ream unit, and the left-hand drill unit. A limit switch starts the tapping motor causing the tapping unit to feed forward by means of a rotating lead-screw. Forward travel of the drill and ream units is reduced to feed rate as the tapping motor reverses its direction of rotation and stops. The operator loads and unloads the work during the operating cycle. A similar machine is designed to semi-finish- and finish-bore the housings.



Shaper equipped with tilting table built by the Cincinnati Shaper Co.

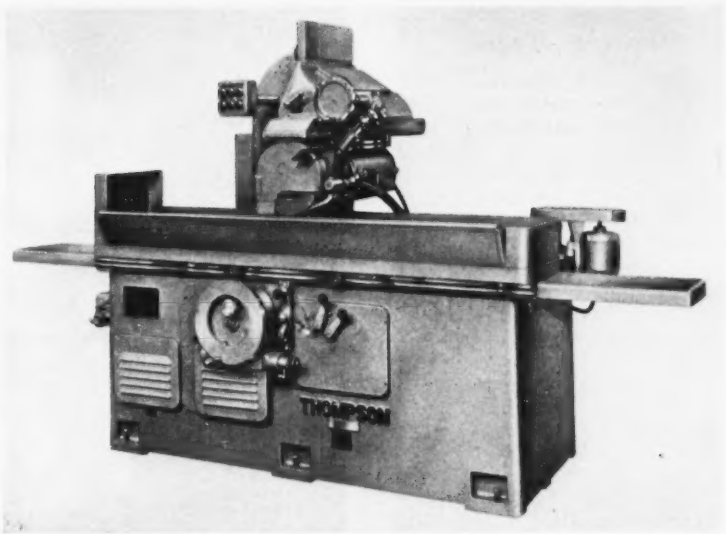
Cincinnati Shaper with Tilting Table

A 24-inch standard shaper, equipped with a tilting table for quick and accurate positioning, has been placed on the market by the Cincinnati Shaper Co., Dept. M, Hopple, Garrard, and Elam Sts., Cincinnati 25, Ohio. The table tilts about a pivot and is adjusted by means of a conveniently located hand crank. A quick clamping arrangement is provided for the table to insure the maintenance of accurate set-ups.

Thompson Hydraulic Surface Grinders

The Thompson Grinder Co., Dept. M, Springfield, Ohio, has brought out a new line of Type B hydraulic surface grinders ranging in sixteen sizes from 6 by 18 inches to 12 by 120 inches. Some features of the grinding machines include a cross-feeding wheel-head with horizontal spindle grinding utilizing the periphery of the wheel; accurate positioning of the work with an anti-friction elevating nut; "in position" wheel truing; integral motor drive to wheel-spindle; a low-pressure hydraulic system; automatic lubrication; a built-in coolant system; and tape bedway covers.

The following items are available as auxiliary equipment: automatic down feed; micrometer back-up stop; coolant flow through the wheel; high-speed spindle attachment; dust collector; auxiliary hand table feed; Hoglund Magni-Form contour dressers; coolant filter; power elevation; magnetic chucks; demagnetizing switches and motor-generator sets; magnetic coolant separators; and wheel balancing ways and arbors.



Hydraulic surface grinder built by the Thompson Grinder Co.

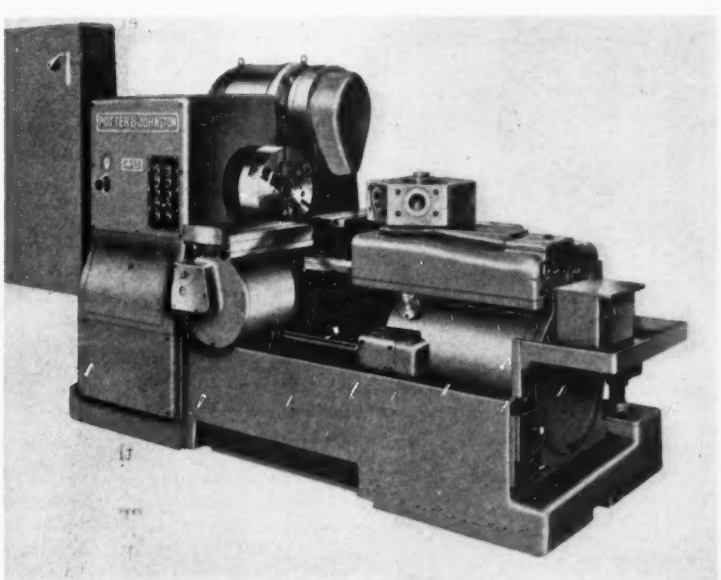
Potter & Johnston Automatic Turret Lathe

An automatic turret lathe, designed primarily for the rapid removal of metal with modern carbide tools, has been announced by the Potter & Johnston Co., Dept. M, Pawtucket, R. I. An 8-inch Type A-1 American Standard spindle nose takes 10-, 12-, or 15-inch chucks. The spindle is mounted in heavy-duty, double taper roller bearings, front and rear. Four automatic, instantaneous speed changes are provided by powerful multiple-disc friction clutches that are electro-pneumatically controlled. By means of pick-off gears, spindle speeds ranging from 45.5 to 1177 R.P.M. can be obtained. A large magnetic clutch and brake, to give cushioned starting and stopping of the spindle, allows greater flexibility in operation. These features, together with a 25-H.P. motor, enable the Model 4U to take full advantage of modern carbide tooling, thus assuring fast metal removal on the toughest materials.

The turret is indexed smoothly by a Geneva movement, and is accurately positioned by means of a lock-bolt. A tapered clamping arrangement in the turret-slide gives a rigid base for the most rugged tooling. The turret-slide has a travel of 12 inches, of which 8 inches is feed. In addition, the slide is adjustable along the base ways. The design of the turret is such that coolant may be pumped either overhead for turning tools, or through the bars for boring and drilling.

The front and rear cross-slides are independent and can be adjusted along the base ways, resulting in unusual tooling opportunities. Large cam-drums operate the slides individually so that they may be used with any or all turret faces. Six automatic feed changes permit an overall feed range of 0.002 to 0.163 inch per spindle revolution for both cross-slide and turret-slide.

All machine functions, including automatic changes of speeds and feeds, rapid traverse, and automatic stopping of the machine, are controlled from a dog drum.

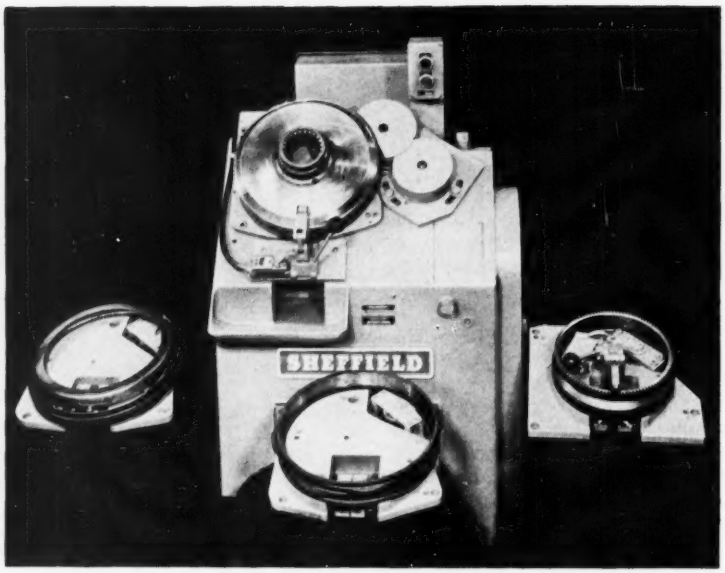


Automatic turret lathe brought out by Potter & Johnston Co.

Sheffield Internal Burring Machine

A new type internal burring machine, designated the Model 388, has been brought out by the Sheffield Corporation, Dept. M, Dayton 1, Ohio. It is designed for chamfering the involute contour of internal splines and gear teeth in either straight or helical form.

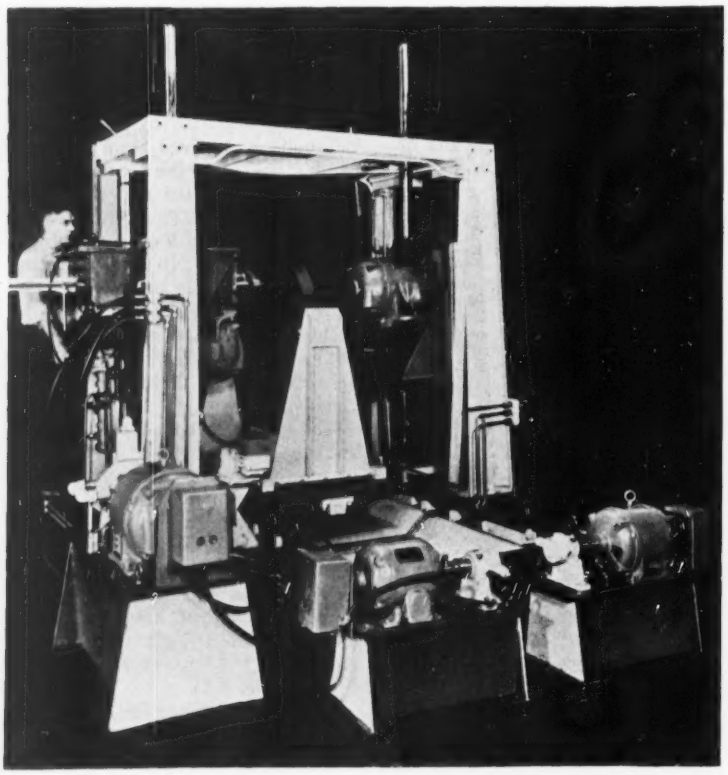
The production rate depends upon the diameter and pitch of the gear teeth, but is said to be up to and including 300 teeth per minute. It is a universal machine tool and is so designed that it can be changed over from one type of gear to another in less than thirty minutes.



Burring machine for internal splines and gear teeth announced by the Sheffield Corporation

Hydraulically Controlled "Opposed Spindle" Drilling Machine

A semi-automatic, hydraulically controlled machine tool, designed to speed drilling operations on medium-sized and large metal parts is announced by Walter P. Hill, Inc., Dept. M, 22183 Telegraph Road, Detroit 19, Mich. The "Opposed Spindle Drill," as the machine has been named, produces closely spaced holes. The machine can be readily adapted to production drilling operations, particularly on a wide range of sizes of tube sheets in condensers, chillers, heaters, evaporators, and coolers.



"Opposed Spindle" drilling machine built by Walter P. Hill, Inc.

Basically, the machine consists of two fabricated steel vertical structures, each supporting two columns and mounted opposite one another. The machine table is traversed on ground steel ways on the base between the two structures. Motorized power heads having integral hydraulic feeds are mounted on each vertical structure. These units can feed individual drills at varying speeds into opposite sides of the work at different levels. The power heads are positioned vertically by twin hydraulic cylinders guided on the two ground circular columns. The heads are designed to resist 23,000-pound unbalanced thrust loads.

The machine table is fed between the spindles by a single hydraulic cylinder. Horizontal table location, as well as the vertical location of each head, is controlled by visible flush-pin type locators that work in conjunction with individual index-plates. A single power pack unit provides hydraulic power for the machine.

Ceramic Permanent Magnet

A new type of magnet composed of ceramic material, which is lighter than metal and requires no critical ingredients, was recently announced by the Indiana Steel Products Co., Dept. M, Valparaiso, Ind. The magnet, called

"Indox," although composed of materials which are non-organic and non-metallic, is magnetized in the same manner as metals. It is claimed, however, that this permanent magnet is virtually impossible to demagnetize by any ordinary means.

Monarch Engine and Toolmaker's Lathes

Providing power rapid traverse and other design refinements for precision performance under continuous, heavy-duty service conditions, a new Series 61 line of engine and toolmaker's lathes has been developed by the Monarch Machine Tool Co., Dept. M, Sidney, Ohio. The models, available in 13-, 16- and 20-inch sizes, incorporate built-in apron-controlled power rapid traverse in a full range of swings, for the carriage and cross-slide. Substantial time-saving and greater operator convenience are claimed for these machines because this design feature provides rapid tool positioning and retraction, and fast carriage return. As a result, tool adjustment time on most work is reduced by about 50 per cent.

Longitudinal movement, either to the right or left, is accomplished at a rate of 160 inches per minute; and lateral movement, in or out, is at a rate of 75 inches per minute. A safety clutch, which disengages automatically if jamming occurs, is provided for all traverse movements. Another feature is a direct length-reading dial built into the apron, which facilitates multiple-diameter turning and blind-hole boring. Other features include totally-enclosed gearboxes and end gearing, automatic pressure lubrication, anti-friction bearings, helical-geared headstock utilizing ground or shaved gears, American Standard cam-lock spindle nose, flame-hardened and precision-ground integral bedways, and the use of hardened alloy steel on all critical parts.

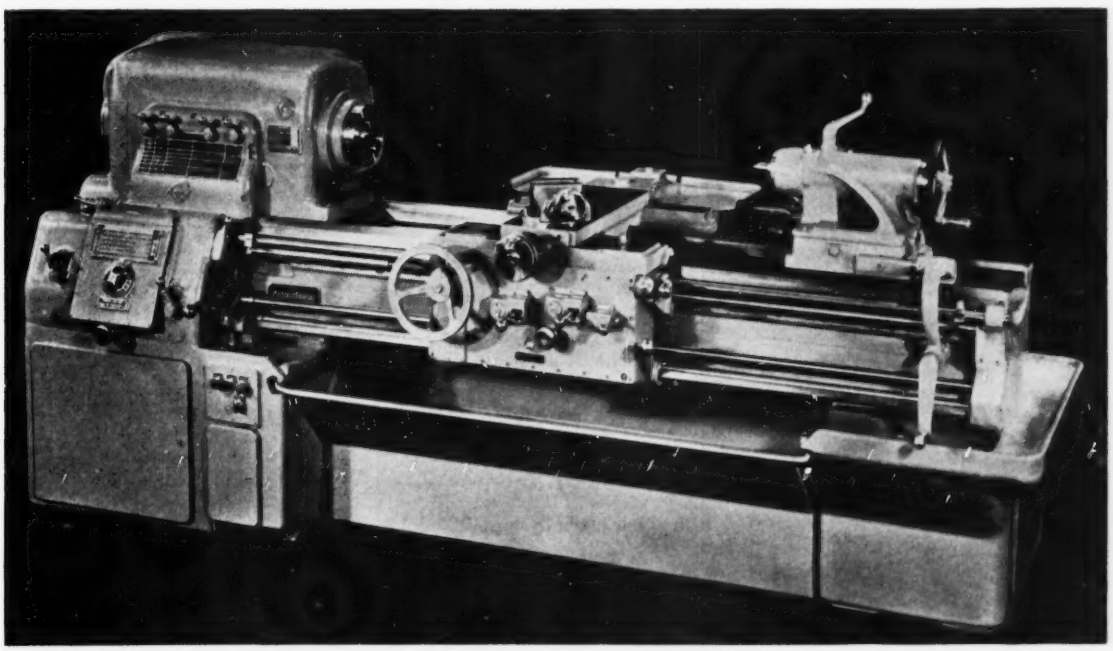
Light-Duty Straightener

The U. S. Tool Co., Inc., Dept. M, Ampere (East Orange), N. J., has recently brought out an improved model of its light-duty, power-driven straightener. The model is suitable for use on cold-rolled steel up to 1/8 inch thick by 6 inches wide. It is equipped with a variable-speed drive unit which makes it a simple matter to control the output speed.

The machine has two power-driven take-in rolls, seven plain straightening rolls, two power-driven take-out rolls, and a 5 to 1 ratio variable-speed drive. A 1/2-H.P. motor, which requires 220- to 440-volt, three-phase, 60-cycle alternating current, operates the straightener. This same unit is also available in 10- and 12-inch capacities. Material supplied in strip form may be accommodated. A mercury switch loop control arrangement maintains a loop of material between the straightener and the press or other machine.



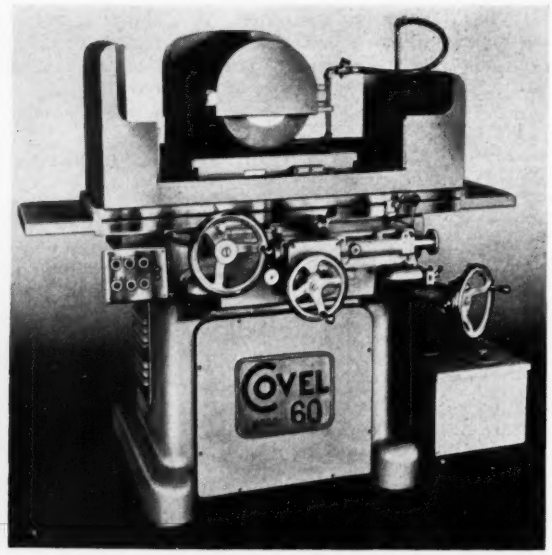
Power-driven straightener built by the U. S. Tool Co., Inc.



Engine and toolmaker's lathe, one of a new series announced by Monarch Machine Tool Co.



Heavy bar stock handling simplified by Hamilton "Portelvator"

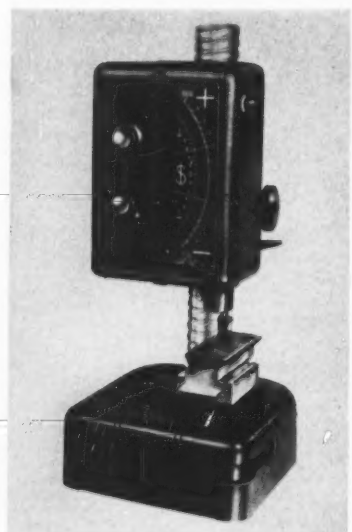


Improved surface grinder brought out by the Covel Mfg. Co.

"Portelvator" Simplifies Bar Stock Handling

The "Portelvator," placed on the market by the Hamilton Tool Co., Dept. M, 834 S. Ninth St., Hamilton, Ohio, is used in the handling and positioning of heavy bar stock. It obtains bars at the receiving dock and transports them to the stock-room where they are stored until needed. As required, the bars are moved by this device from the stock-room to the sawing machine where the material is height positioned and fed directly to the saw.

Slots between rollers Nos. 1 and 2 and rollers Nos. 3 and 4 enable the chain of the overhead crane to be wrapped around the billets more securely. The 18- by 20-inch table has a capacity of 2000 pounds and a vertical travel of 14 inches. Minimum height from floor is 20 inches and maximum height is 34 inches. It is elevated by a hand crank which is located on the side to permit the extension of the bar stock over each end.



Vertical mechanical comparator introduced in this country by the Cosa Corporation

Mechanical Comparator with Magnifications up to X3000

The Sigma mechanical comparator is being introduced in this country by the Cosa Corporation, Dept. M, 405 Lexington Ave., New York 17, N. Y. Because it is completely mechanical, it may be set up at the production line, in the tool-room, or in the inspection department without altering electrical facilities.

The comparator has magnifications of X500, X1000, X1500, and X3000 with capacities of 6 and 12 inches in each magnification. All moving parts are mounted in ball bearings. Vertical adjustments are provided for the head and table. Adjustable limit indicators can be locked in position if desired.

Covel Surface Grinder for Precision Work

A new model precision surface grinder has been introduced by the Covel Mfg. Co., Dept. M, Benton Harbor, Mich. This Model No. 60 features a 14- by 24-inch work surface, 15-inch cross-feed, 27-inch table travel, and a vertical work capacity of 18 inches. It is ideal for grinding trim and mold dies, plastic molding and forming dies, form and cut-off tools, and a variety of other tool-room and production jobs.

The surface grinder has a table speed of 10 to 90 feet per minute. Other features include an elevating handwheel located below table level, a built-in wheel truing device, a closed hydraulic circuit, complete dust-protection, powered elevation, and automatic lubrication equipment.

Multiple Clamping Device with Compensating Equalizer

A device that clamps up to ten parts simultaneously and automatically compensates for size differences is being manufactured by the Design Aids Co., Dept. M, N. 7th St., Newark 7, N. J. The compensating equalizer provides a definite mechanical lock for hard or soft parts, regular or irregular in contour. The equalizer can be applied to all types of vises for



Multiple clamping device made by the Design Aids Co.

milling, grinding, and other operations, and can be used as a component part of jigs and fixtures.

The compensators have separate, sliding jaws—one for each work-piece—which are backed up by a chamber of floating vertical rollers. These rollers shift their positions to exert equal pressure on each jaw. The jaws are held in the unit by a common key that permits sufficient movement in each jaw for the automatic individual take-up.

The units are available in three types: one for multiple clamping of hard metal parts; a second for soft material, such as aluminum and plastics; and a third that will compensate for draft angle and surface irregularities on castings and forgings. There are five to ten jaws, with jaw widths ranging from 1 1/2 inches to 3/8 inch.

Optical Gear Analyzer

Optical Gaging Products, Inc., Dept. M, 26 Forbes St., Rochester 11, N. Y. have brought out an optical gaging gear analyzer. Direct observation of a magnified gear image allows inspection, analysis, and gaging of the gear under simulated operating conditions. The need for interpolative data is eliminated by this design.

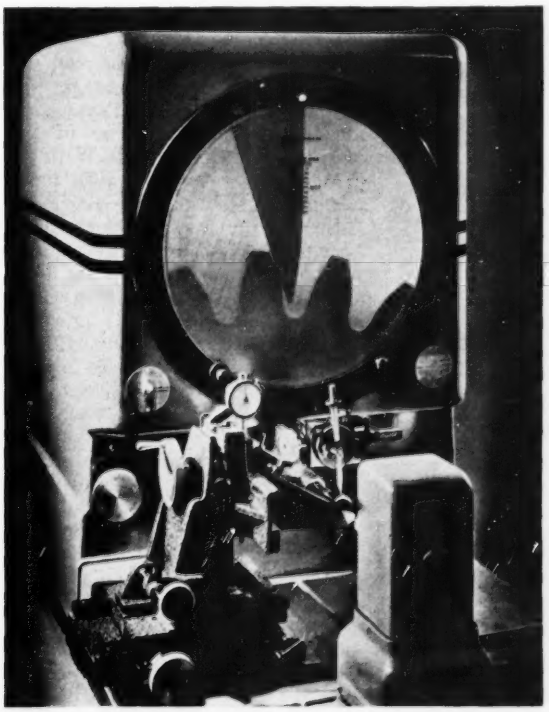
This gear analyzer checks a wide range of gear sizes—and no master gear is required. Complete analysis of "running conditions" can be made, even when the gear operates with backlash. The gear is viewed on a Kodak contour projector as it rotates in contact with, and at the correct center distance from, a composite rack chart.

Internal and External Thread Gages

The George Scherr Co., Inc., Dept. M, 200 Lafayette St., New York 12, N. Y., is introducing a new line of indicating thread gages in this country. One is a roller thread pitch diameter comparator gage for external threads, and the other a dial thread plug gage for checking internal threads. Both instruments are designed for quick inspection.

The roller thread pitch diameter comparator gage has an indicator calibrated in 0.0001 of an inch which is set by means of a master thread gage. Two hands on the dial are set to the required tolerances. The thread to be checked is inserted between two rollers and variations in pitch diameter are quickly read from the dial. Out-of-round errors may be detected by revolving the work between the measuring rollers.

The dial thread plug gage measures internal threads by means of



Gear tooth profile is checked on gear analyzer developed by Optical Gaging Products, Inc.



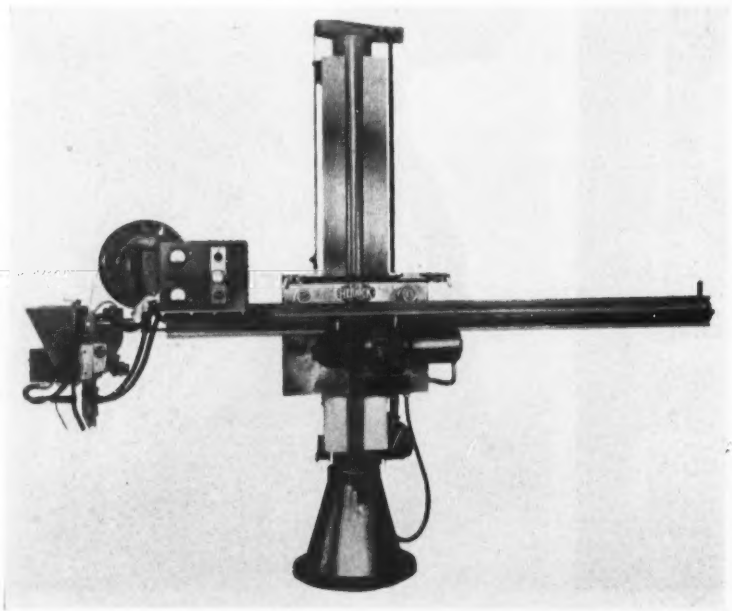
Comparator for gaging external threads being introduced by George Scherr Co., Inc.

three interchangeable measuring jaws, the two outer jaws being fixed and the central jaw movable. A ring gage is first used to set the indicator to zero, after which the jaws are inserted into the work. Variations may be observed on the dial which was previously set to prescribed tolerances by two adjustable hands.

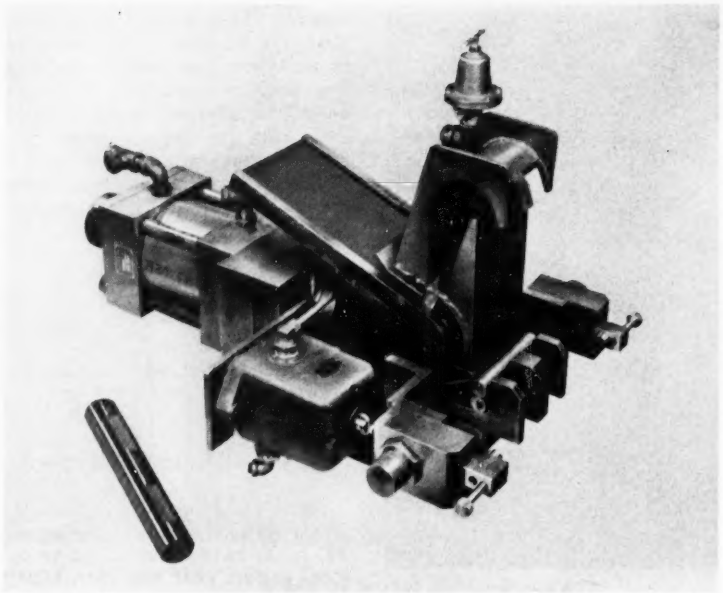
Herrick Automatic Welding Fixture

The C. B. Herrick Mfg. Corporation, Dept. M, 2000 Center St., N. W., Cleveland 13, Ohio, is announcing a ram type welding fixture featuring precision and versatility, for lower-cost automatic welding. The tubular lateral ram, with automatic head attached, travels 6 1/2 feet over the positioned or rotating work. A variable-speed drive provides a welding speed range of from 0 to 100 inches per minute. Vertical adjustment is motorized and ranges from 13 inches to 6 feet. Both the tubular column, which contains a counterweight, and the ram rotate 360 degrees.

The fixture, together with welding generators and flux recovery equipment, may be mounted on the carriage. Two larger models are available, one with an 8-foot lift and a 10-foot ram travel, the other with a 10-foot lift and a 12-foot ram travel.



Ram type welding fixture marketed by C. B. Herrick Mfg. Corporation



Automatic loader for "Red Ring" broaching machine

Automatic Loaders for Single-Ram Broaching Machines

A line of "Red Ring" automatic loaders for single ram vertical surface broaching machines is announced by the National Broach & Machine Co., Dept. M, 5600 St. Jean, Detroit 13, Mich. The loaders are particularly adapted to the handling of round parts on which flats, slots, or ends are broached in single-ram machines. They have magazine feed arrangements that work in conjunction with a load-and-unload mechanism operated by a hydraulic cylinder.

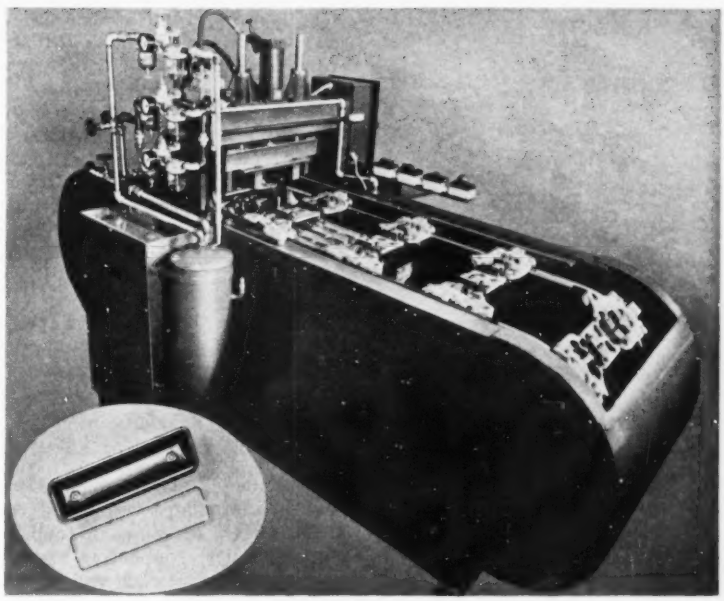
The loader shown in the illustration positions two automotive automatic transmission control rods in front of a broach on a single-ram vertical type machine which finishes two slots and one end of each control rod by the broaching process. Parts are loaded on the magazine of the loader between side rails. With the vise jaws retracted, two parts drop into position, one above the other in the jaws. Then the jaws are pushed forward against a stop by the cylinder, and the air booster applies high clamping pressure. The resulting pressure build-up in the hydraulic cylinder causes a sequence valve to initiate the ram down stroke, broaching two flats and the end of each part simultaneously. When the ram reaches the bottom of the stroke, the high clamping pressure is released and the ram returns to the top of the stroke. Two unloading dogs on the top of the broach-holder grip the two parts and carry them up out of the vise jaws. A curved chute at the top of the loader picks off the parts from the unloading dogs.

"Red Ring" single-ram broaching machine automatic loaders are made in a variety of sizes to meet specific application requirements,

the majority being built around the basic design of the loader described here. The fixture described permits a broaching production of 650 transmission control rods per hour.

Automatic Resistance Welder

A machine that combines resistance welding and built-in automation has been manufactured by the Multi-Hydromatic Welding & Mfg. Co., Dept. M, 23171 Groesbeck Highway, East Detroit, Mich. Simplicity in loading makes possible a production rate claimed to be in excess of 600 units per hour. This particular machine was built to weld retainers to valve gasket covers. A continuous chain conveyor carries twelve fixtures which are moved intermittently by means of an air cylinder. Positive location is obtained by an air-operated stop-pin. When a fixture comes into the welding station, an air-operated cylinder applies pressure to the part, pushing the fixture onto locating pins and the valve cover over the back-ups. Twelve spot welds are made simultaneously on the assembled parts by this welder.



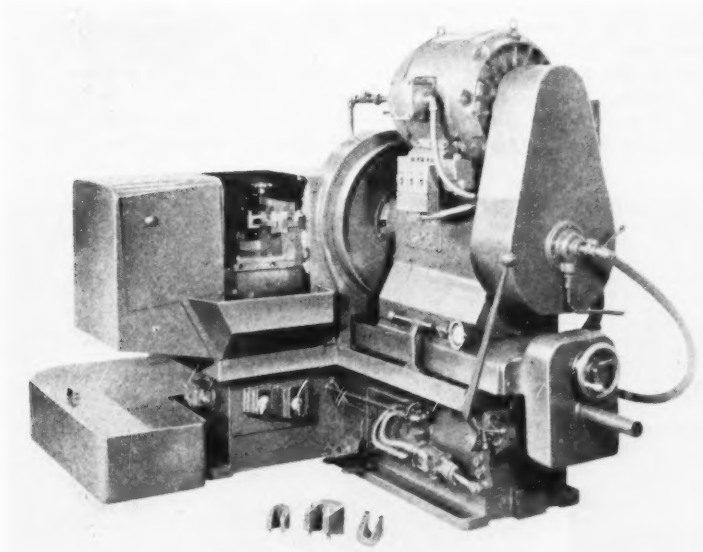
Parts are automatically fed, clamped, and spot-welded in this machine made by Multi-Hydromatic Welding & Mfg. Co.

Gardner Horizontal Spindle Grinder

A horizontal spindle grinder equipped for finishing the ends of horseshoe magnets has been built by the Gardner Machine Co., Dept. M, 414 E. Gardner St., Beloit, Wis. This machine consists of a base of welded steel construction, supporting the head slide upon ball bearing ways. The head slide is provided with a hydraulic cylinder to hold the head in against a micrometer-adjusted stop, which controls the amount of stock to be removed.

The grinding head has a heavy spindle 3.937 inches in diameter at the wheel-collar end, a double roller type bearing for taking the radial load, and two special thrust ball bearings. The hydraulically operated work-table travels on dovetail ways, and has a working surface approximately 15 inches wide by 18 inches long.

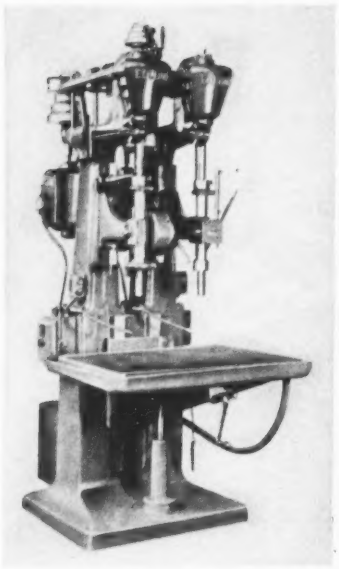
The fixture is a hand-clamping type with adapters for the various sizes of magnets, three sizes of which are shown in the foreground of the illustration. The grinding head is driven by a 25-H.P. motor. The ends of the Alnico horseshoe magnets have areas of 3 and 5 square inches which are ground to an accuracy of 0.0003 to 0.001 inch flatness at the rate of twenty-five pieces per hour. From 3/64 to 1/16 inch of stock is removed by the grinding operation.



Horizontal grinder equipped for grinding ends of horseshoe magnets

Neoprene Fan Hub

The Torrington Mfg. Co., Dept. M, Torrington, Conn., has developed an improved neoprene fan hub for use on shaded pole motors. The hub acts effectively as a means of minimizing noises in both the motor and the system. Great flexibility of this hub is claimed to create a "very soft" system which effectively lowers the noise level of the units involved.



Vertical motor cone-pulley drive drilling and tapping machine made by Edlund Machinery Co.

Improved Edlund Drilling and Tapping Machines

The Edlund Machinery Co., Dept. M, Cortland 19, N. Y., has announced new developments in its Model B line of drilling and tapping machines. Models now in production are the 1B with a 7- and 12-inch overhang; the 2B, with an 8-inch overhang; the 3B, with a 12- and 15-inch overhang; and the 4B, with a 12- and 16-inch overhang.

Three speed ranges are incorporated in the 1B machine, from a low of 500 R.P.M. to a high of 2080 R.P.M. It has a 5/8-inch drilling capacity and is available in units of one to six spindles. The 2B and 3B models have a 1 1/4-inch capacity and four speed ranges from 240 to 2380 R.P.M. These machines are available with one to eight spindles.

Model 4B, with a 1 1/2-inch drilling capacity, is made with one to four spindles in either a pedestal or a bench type machine. Other models with single or multiple spindles are pedestal type machines. The 4B also has four speed ranges from a low of 80 R.P.M. to a high of 2004 R.P.M.

Standard attachments are available such as the semi-automatic power feed and reversing motor tapper for the entire line of Model B machines. A lead-screw tapper and a ball-bearing back-gear attachment are also available for Models 2B, 3B, and 4B. The back-gears are standard equipment on Model 4B. On machines of four or more spindles, supporting standards are added at each end of the table to prevent deflection due to drilling pressure.

Hi-Frequency Motors

The Bryant Chucking Grinder Co., Dept. M, Springfield, Vt., is announcing the availability of its compact Hi-frequency motors for both experimental and production applications. The rotor of each unit is mounted directly on the spindle and is the only moving part, since there are no brushes or moving contacts. The stator, carrying the motor windings, is cooled by a water jacket. Lubrication is provided by an oil mist carried in a stream of air. The motor is totally enclosed and remains clean indefinitely.

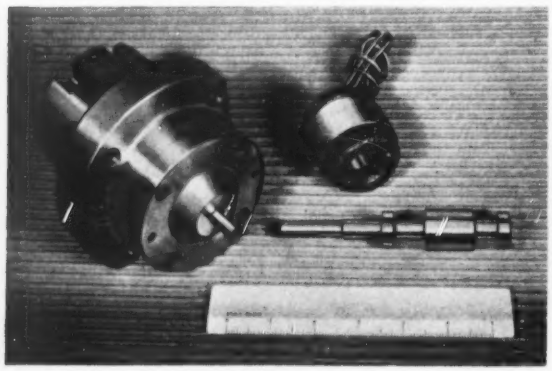
Normally, pre-loaded precision ball bearings are used. For certain applications in the higher speed ranges, however, special air bearings in which the spindle rotates on a cushion of compressed air have been designed. The latter construction is used for light loads, and has the advantage of being virtually friction-free.

General Electric Instrument Standardization Equipment

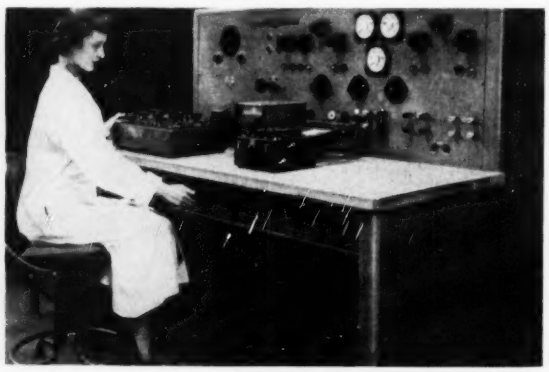
An instrument standardization console built for general instrument calibration has been announced by the Special Products Section of the General Electric Co., Dept. M, Schenectady 5, N. Y. It supplies low-distortion regulated power in the audio-frequency range of 50 to 3000 cycles per second and finds a definite application in the aircraft industries which require 400- and 800-cycle instrument standardization. Alternating- and direct-current supplies are provided on conventional bus-bar facilities up to 150 amperes and 750 volts. "Transfer standards" are used to transfer alternating-current values to the more easily measured direct-current values, a method which extends the high accuracy and stability of direct-current potentiometer standardization equipment into the audio-frequency range of instrument calibration.

The G-E console is composed of two sections: the back or cabinet section, which contains most of the sub-assemblies; and the front or table section, which serves primarily as a work area. The work surface is non-magnetic, removing chance of error due to shunting effect of a magnetic material.

The direct-current potential supply consists of a rectifier unit and a filter unit. A conventional full-wave rectifier circuit uses a three-stage filter so the 120-cycle



Bryant Hi-frequency motor and component parts



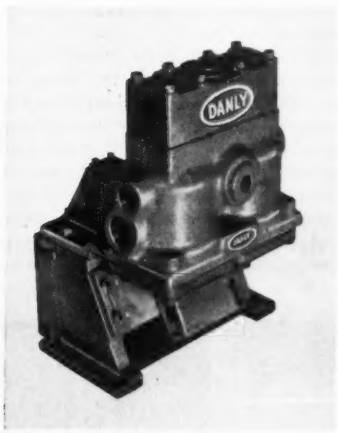
General Electric instrument standardization console

ripple is reduced to a low value. For low-voltage operation below the stability limit of the direct-current supply, a dry type, six-volt battery can be used as a source of power.

Air Clutch Valve Increases Press Operating Safety

Danly Machine Specialties, Inc., Dept. M, 2100 S. Laramie Ave., Chicago 50, Ill., has designed a dual air valve specifically to eliminate one of the hazards of mechanical press operation—accidental stroking due to valve failure. The unit consists of two independent pilot-operated valves. Electromagnets actuate the pilot valves and the main valves are operated by air. The two independent valves are built into a single unit.

The safety of the unit can be demonstrated by holding either side of the valve open. In this situation, the other side of the valve continues to function normally through the independent action of its electromagnet, exhausting the clutch and bringing the press to a fast, safe stop. It is said that this construction offers a safety factor that is not dependent on the mechanical life of the valve. The valve may be installed on the press with a pressure switch, so that should either side of the valve fail to function, the resulting drop in pressure in the air supply tank will break the control circuits, thus preventing further press operation until the trouble is corrected.



Dual air valve has been placed on the market by Danly Machine Specialties, Inc.

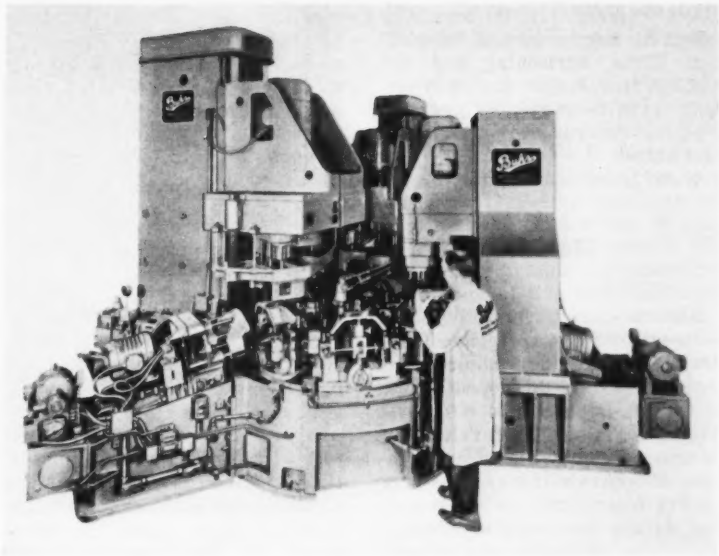


Fig. 1. Buhr machine for processing flywheel housings

Buhr Automatic Machine Processes Two Models of Flywheel Housings

An automatic machine, capable of processing two models of flywheel housings simply by exchanging tools, has been completed by the Buhr Machine Tool Co., Dept. M, Ann Arbor, Mich. The machine is a five-way automatic with a six-station fixture designed with hydraulic clamping. A 60-inch diameter automatic index-table supports the fixture.

Forty-two operations are performed on each flywheel housing at the rate of 100 pieces per hour—twenty-one drilling, eight chamfering, two reaming, ten tapping, and one boring. The machine is equipped with hardened and ground, laminated tool steel ways, and has ball-bearing construction for all spindles. Lubrication is automatic throughout. Electrical and hydraulic installations comply with Joint Industry Conference standards.

Electrode Coating Contains Powdered Metal

A new electrode, called "Jetweld," has been announced by the Lincoln Electric Co., Dept. M, Cleveland 17, Ohio. Powdered metal is incorporated in the electrode coating so that the heat of the arc may be employed more efficiently.

The electrode is a heavily coated shielded-arc type designed for operation in flat or near flat positions with either alternating or

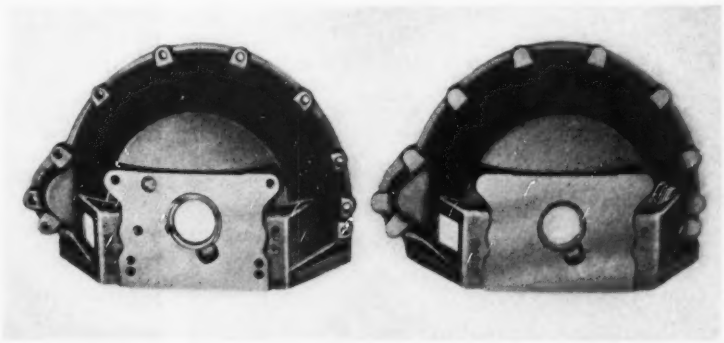


Fig. 2. (Right) Casting as loaded into Buhr automatic machine; (left) after completion of machining cycle

direct current. It is especially suited for horizontal and flat position fillets, horizontal and flat position laps, single- and multiple-pass butts, deep grooves and corners, and cover passes on multiple-pass butts.

Welding speeds typical in lap and fillet work range from 12 to 15 inches per minute. Bead appearance is smooth, comparable to that normally associated with automatic hidden-arc welding. The slag produced curls off as it cools to make the welds practically self-cleaning.

Mechanical Comparator Developed for Assembly Line Checking

Accuracy and versatility are claimed for a low-cost "Producto-Chek" lightweight mechanical comparator recently developed by the DoAll Co., Dept. M, 354 N. Laurel Ave., Des Plaines, Ill., for checking on the assembly line. Three adjustments provide for rapid setting of the comparator to check any size within its capacity. First, a lead-screw on the column is used for coarse adjustments and to facilitate rapid rough-positioning of the gaging head. The second adjustment is provided by a fine-thread thumb-screw which moves the gaging head slightly up or down. A lever by which the dial scale is moved from left to right for minute "zeroing" movements or for setting the scale "off zero" to compensate for known errors in masters provides the third adjustment.

The gaging head of the comparator has a unique amplifying arrangement consisting of a "double reed" designed to eliminate lag, backlash, and wear. The double reed amplifying system makes the comparator self-compensating with respect to temperature changes so that it maintains its accuracy over a wide temperature range.

Coil springs damp the movements of the reeds, providing smooth, vibrationless indications. The "Producto-Chek" is said to consistently give the same repeat readings on a test piece under the same gaging conditions. The measuring pressure of the spindle is low but constant. The column can be rotated on the base, permitting the instrument to be used with a surface plate or master flat adjacent to the instrument. The comparator is available in several ranges in both English and metric calibrations.

Belmont Wet-Blast Cabinets

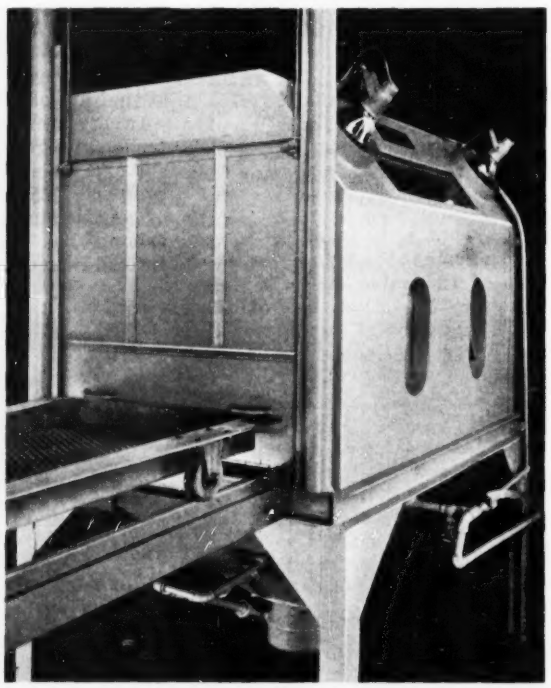
The Vacu-Blast Co., Inc., Dept. M, Box 885-WB, Belmont, Calif., is bringing out a line of Belmont wet-blast cabinets designed to rapidly remove surface contamination from metal parts and polish with a water-suspension slurry of fine abrasive. The cabinets can also be used to remove burrs and directional grinding lines, and provide a matte surface for retaining lubricating oil.

Agitation of the slurry is accomplished by a "Whirlpool" mixing device. An air ejector draws liquid from the top surface and shoots it tangentially into the mixing chamber. Strong suction is provided by the annular air jet, and slurry is pulled through the gun. Then the surrounding high-speed air accelerates the slurry to a higher speed causing it to be forcefully expelled through a long converging nozzle.

A high-pressure centrifugal blower pulls vapor from the cabinet through a filter, and a water spray cleans the filter and drains to a separate sump. The cabinet is 48 inches wide by 36 inches deep. The over-all height of the cabinet is 6 feet 3 inches, and the weight of the complete unit is 850 pounds.



"Producto-Chek" mechanical comparator made by DoAll Co.



Belmont wet-blast cabinet for cleaning metal parts



Brush Surfindicator for measuring surface roughness

Brush Surface Measuring Instrument

An instrument for measuring surface roughness, called the "Surfindicator," has been introduced by the Brush Electronics Co., Dept. M, 3405 Perkins Ave., Cleveland 14, Ohio. This instrument is being manufactured under an exclusive license from the General Motors Corporation. It is designed to provide a versatile and economical means for making nondestructive tests that require no special knowledge for its use.

Surface roughness can be measured by this instrument within the range of from 1 to 1000 micro-inches average deviation from the mean surface. A variable cut-off switch permits the separation of waviness and roughness characteristics of surfaces by filtering out wave lengths exceeding 0.003, 0.010, or 0.030 inch. This feature is important in many applications, such as determining the surface conditions of bearing surfaces and highly stressed parts.

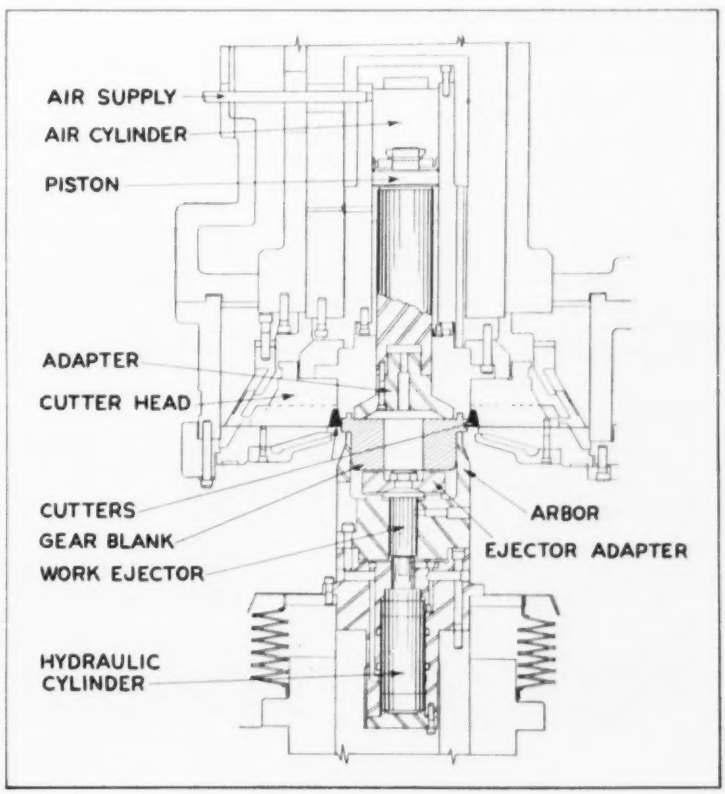
When the diamond tip stylus of the instrument moves across the peaks and valleys of the surface to be measured, the microscopic mechanical motion is transformed by a movable plate vacuum-tube transducer into electrical signals. These signals are amplified and indicated on the meter as surface roughness in micro-inches. An operator need only select the proper roughness and cut-off scales, guide the pick-up over the work, and read the meter. The Surfindicator is equipped with precision reference specimens which provide a means for simple and accurate calibration of the instrument. It weighs 15 pounds, and can be set up in any location where 115-volt, 60-cycle current is available.

New Devices Available for "Shear-Speed" Gear Shaper

Two new devices are now available for the "Shear-Speed" gear shapers built by the Michigan Tool Co., Dept. M, 7171 E. McNichols Road, Detroit 12, Mich. One is a pneumatic holding mechanism built into the head of the shaper, as shown diagrammatically in the illustration, to allow for automatic positioning of the gear blank and for clamping it in place during the shaping operation. The other is a manually controlled hydraulic device that ejects the gear blank after the shaping operation is completed.

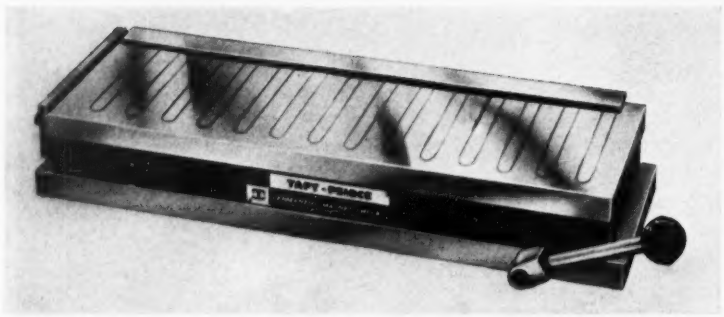
The hydraulic ejector cylinder is mounted integrally with the reciprocating vertical ram that carries the work-arbor. An ejector adapter attached to the hydraulic piston is raised against the lower face of the gear to eject it after the cutting cycle is completed. Only plant air is required in the air cylinder for clamping. No accumulator tank is needed to take care of changing volume.

Cup-shaped sleeve adapters are fitted into a tapered hole in the



Cross-section of pneumatic work-holder and hydraulic ejector installed on a Michigan "Shear-Speed" gear shaper

bottom of the air cylinder piston. These adapters fit over the top of the arbor or over the end of the gear-shaft, and move down to bear against the upper face of the gear. Some advantages offered through use of the pneumatic work-holder include quicker and simpler clamping, positive location, support for both ends of the work-holding arbor or integral shaft, and elimination of the problem of loose pieces in handling.



"Superpower" permanent magnet chuck made by Taft-Peirce Mfg. Co.



Fig. 1. Shock-absorbing and leveling machine mount

Shock-Absorbing Leveling Mounts for Machine Tools

Shock-absorbing leveling type mounts for machine tools and all kinds of power-driven equipment are being manufactured by the Barry Corporation, Dept. M, 1000 Pleasant St., Watertown 72, Mass. These mounting devices, known as "Barrymounts," have been designed to eliminate the necessity for bolting machine tools to cement floors and at the same time prevent "walking" or moving of a machine from its set-up position. This outstanding feature is made possible by constructing the mount as shown in the cross-sectional views in Fig. 2. The cushioning rubber element is so arranged in the metal members of the mount that vibration acting in a horizontal as well as a vertical or any other direction is readily absorbed.

The installation of a Barrymount on a machine foot, as seen in Fig. 1, is easily accomplished. The machine foot is lifted, the mount placed under it, and the attaching bolt with lock-nut slipped through the mounting hole into the mount. The bolt is then turned down until it has bottomed. After each foot has been supported in this manner, each bolt is turned down just enough to level the machine, and the lock-nuts tightened.

The mounts are available in load ratings to suit any machine, including grinding machines, presses, and lathes. They are designed to isolate sensitive machinery from building or floor shocks and vibrations as well as absorb the shocks and vibrations produced by the machine itself.

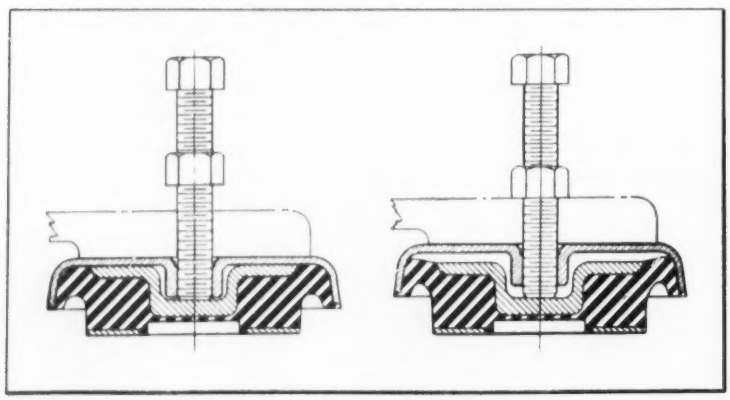


Fig. 2. Barrymount shock-absorbing machine mount shown in Fig. 1 before and after leveling

Taft-Peirce "Superpower" Permanent Magnet Chucks

A "Superpower" permanent magnet chuck is a recent addition to the line made by the Taft-Peirce Mfg. Co., Dept. M, Woonsocket, R.I. This chuck is compact and exceptionally low in height, an important feature that provides increased clearance between a grinding wheel and chuck. The incorporation of more magnetic poles in relation to the chuck length has also made possible a larger work-holding area.

The latest developments in alloy magnet material have been used to achieve maximum power. The holding power is easily controlled by progressively moving the hand-lever, from the minimum to the maximum position. This feature serves to eliminate distortion in holding certain types of work. Since no electrical current is applied, the chuck operates without heat, an important factor in eliminating warping of work-pieces.

The chuck is especially adapted for surface grinding, but can be readily employed in other machining operations such as light milling, planing, and shaping. Small models can be used to hold tools for inspection or test purposes and work in hand-finishing, burring, polishing, and scraping.

Drill Guide Provided with Adjustable Stop

The E & E Engineering Co., Dept. M, 15023 Harper Ave., Detroit 24, Mich., is distributing an adjustable aluminum drill guide that can be applied to either portable power tools or drill presses. It has a stop that can be adjusted for drilling a hole to any desired depth from 3/4 inch on hand tools to 1 1/4 inches when mounted on a drill press.



Portable drill equipped with "sine" drill guide and stop placed on the market by the E & E Engineering Co.

With this attachment it is not necessary to use drill bushings in jig plates, as the pilot is designed to accept the desired drill size and thus takes the place of the bushing. The jig plate may be made of cold-rolled or fabricated steel or plastic, with reamed holes to accept the pilot tip, thereby reducing the cost of the drill jig.

Drill breakage is reduced to a minimum, since the drill runs inside the pilot when entering any hole in the jig plate. As pressure is applied to the drill, the pilot slides into the body housing bushing, allowing the drill to enter the work.

Link-Belt Variable-Speed Drives

Two new types of positive, infinitely variable speed drives for 20- to 25-H.P. applications have been brought out by the Link-Belt Co., Dept. M, 307 N. Michigan Ave., Chicago 1, Ill. In addition to the basic H-6 P.I.V. (positive infinitely variable) Link-Belt drive, the company can now supply an HG-6 drive, furnished with either a single reduction input or single reduction output helical gear attachment, or an HGG-6 drive furnished with both. Input gear reductions are available in ratios from 1.93 to 1 up to 5.82 to 1, and output gear reductions can be had in ratios of 1 to 1 up to 6.33 to 1. Speed-increasing gear sets are also available.

The complete line now includes P.I.V. drives in eight sizes, covering a capacity range of from 1/2 to 25 H.P. with ratios up to 6 to 1, in sixteen types, for horizontal and vertical mounting, with and without helical gears and integrally mounted motor. These drives provide accurate speed control and are adjustable over a wide range of speeds.

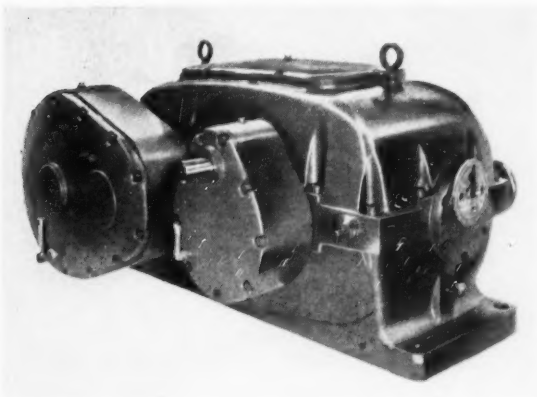
These drives transmit power positively, without slip, by means of a drive chain with self-forming metal teeth that engage radial grooves in two pairs of cone-shaped wheels. The ratio is changed by altering the effective diameter of the wheels.

The drives are used to obtain exact synchronization and timing of operations; reliable metering and proportioning; precise control and infinite variation of machine or conveyor speeds; and rapid speed changing under full load by manual, automatic, or remote control. The P.I.V. automatic controls can be of the electronic, hydraulic, pneumatic, or mechanical type. The drive is fully enclosed, constructed of metal, and has moving parts splash-lubricated from a common reservoir. The drive is said to be unaffected by high or low temperatures, variations in humidity, abrasive dust, or explosive vapor conditions.

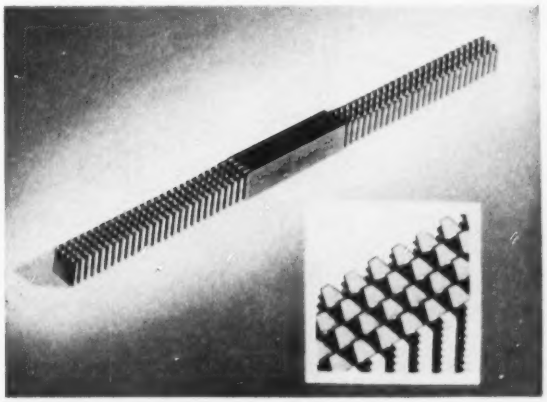
"Nu-Trix" Thread-Restoring Tool

External threads that have been damaged or deformed are said to be quickly returned to their original condition without reducing the root and outside diameters by the use of a thread-restoring tool developed by the Reiff & Nestor Co., Dept. M, Lykens, Pa. This tool, called "Nu-Trix," eliminates the old methods of shaping with a three-cornered file or using a die, which have the disadvantages of removing metal from the thread diameters. Used like a file, a few quick passes across the damaged threads with the "Nu-Trix" tool removes burrs and deformed metal, reshaping threads to their original conditions.

The thread restorer is made of hardened steel. It is 8 1/2 inches long by 7/16 inch square, and is available for either National Coarse or National Fine threads. There are eight thread sizes on each tool.



Variable-speed drive brought out by the Link-Belt Co.

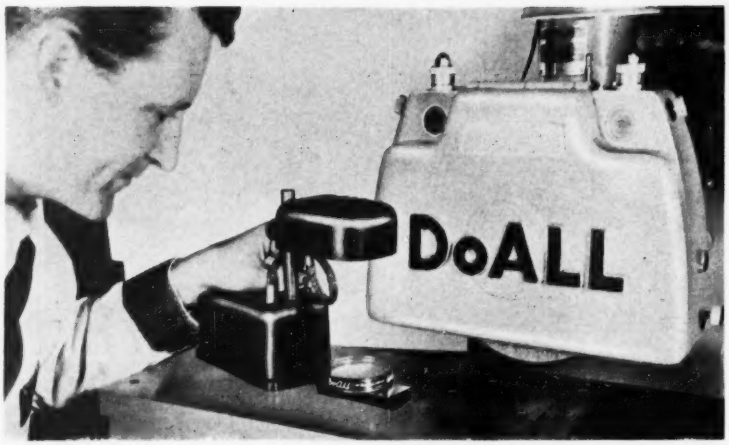


Thread-restoring tool developed by Reiff & Nestor Co.

Small Monolight for On-the-Job Inspection

The DoAll Co., Dept. M, 254 N. Laurel Ave., Des Plaines, Ill., has placed on the market a featherweight 2-inch monochromatic light generator for inspection of flatness, finish, and size with optical flats. This Monolight rounds out the company's line of 5- and 20-inch units.

Because of its size, the new unit is suited for use in on-the-job checks at production machines, production inspection stations, or for use by roving inspectors. Adequate magnetic shielding of lightweight aluminum permits inspection to be made on magnetic chucks when chuck power is on. The light generating element, which operates on 110-volt, 60-cycle current, is helium.



Roving inspection may be made with 2-inch DoAll Monolight

"Floating Torch" Designed to Automatically Cut Bevels on Steel Plate

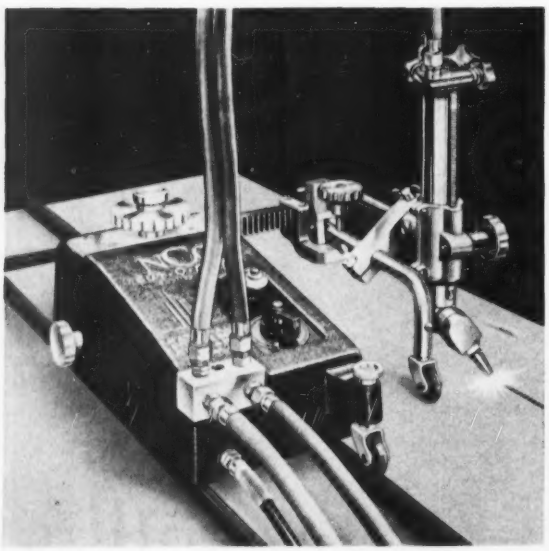
A "floating torch" assembly for accurate bevel cutting regardless of humps, bows, or other unevenness in steel plate, has been developed by the National Cylinder Gas Co., Dept. M, 840 N. Michigan Ave., Chicago 11, Ill., for use with its Cut-O-Matic portable flame-cutting machine. The unit has two principal parts: a guide wheel and a newly designed beveling torch.

The guide wheel, which rests on the plate being cut, controls the distance between the torch tip and the plate. It automatically raises or lowers the torch to compensate for any unevenness present in the plate which otherwise would change the line of the bevel. The torch is equipped with a swivel head which permits the tip to be rotated to cut whatever angle of bevel is required for subsequent welding operations.

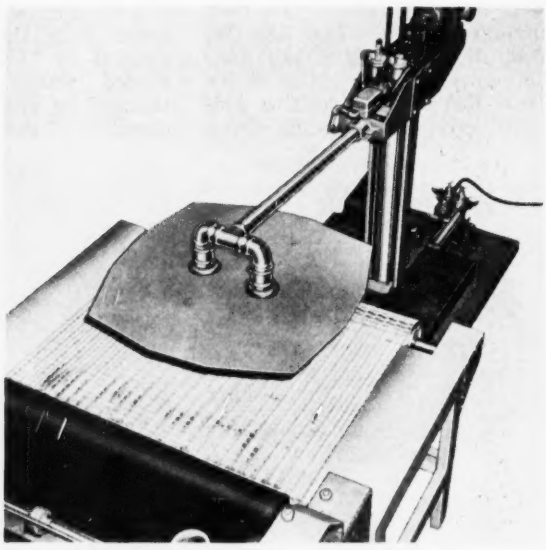
The Cut-O-Matic to which the torch is attached is a motor-driven cutting machine weighing less than 50 pounds designed to cut straight lines, circles, arcs, rings, strips, and various irregular shapes. It can be used to cut steel plate, slabs, and pipe up to 7 inches in thickness with a standard two-hose torch. With a special three-hose torch, the cutting capacity is increased to 16 inches.

Automatic Vacuum Lift for Handling Metal Sheets

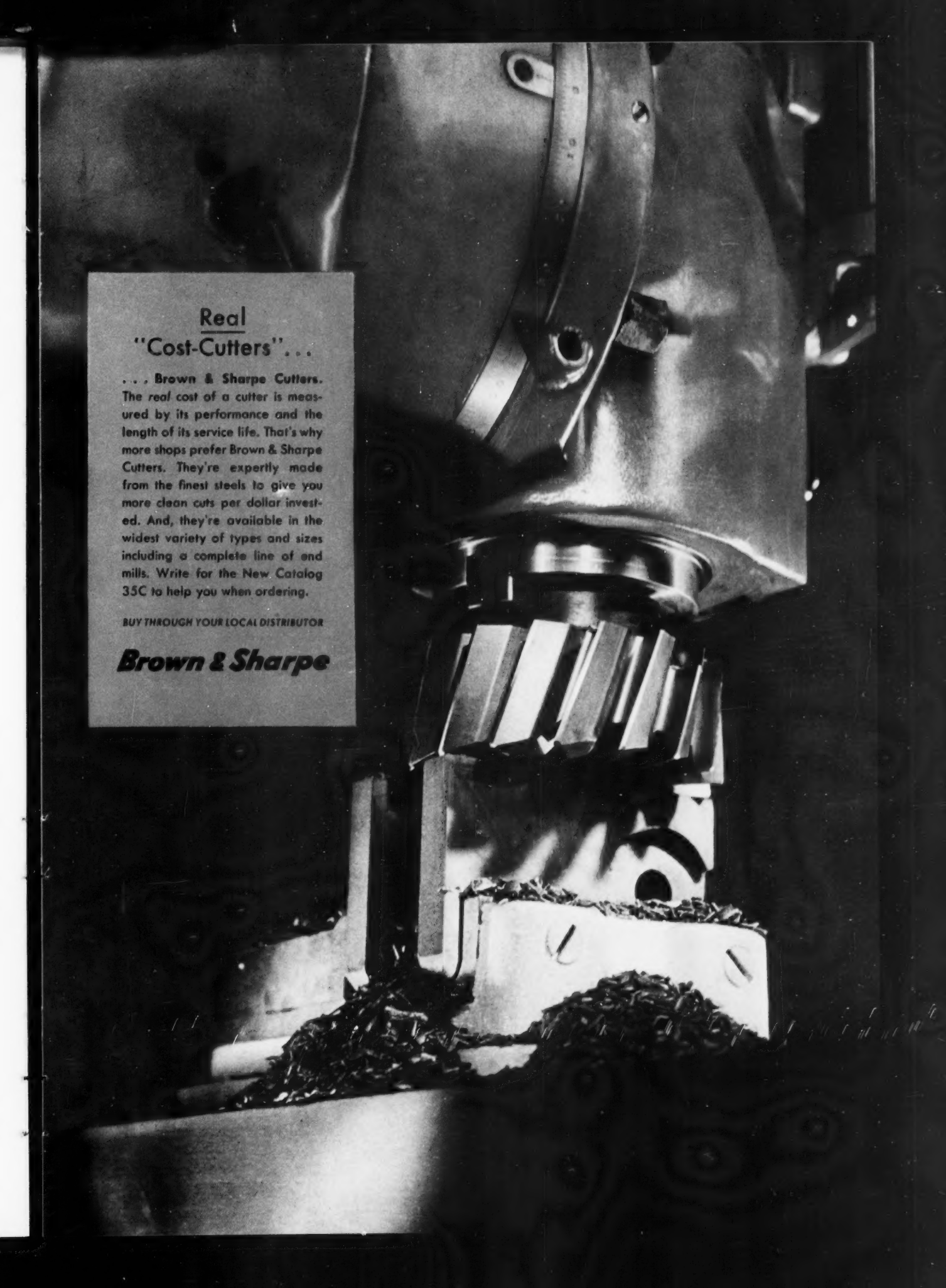
An automatic vacuum lift for metal sheets is now being manufactured by the Union Tool Corporation, Dept. M, Warsaw, Ind. The lift contains its own vacuum plant and is shipped completely assembled, ready to connect to electric power and air lines. It will handle any non-porous metal sheets up to 40 by 40 inches at the rate of one to six sheets per minute. Sheets can be picked up at any level from

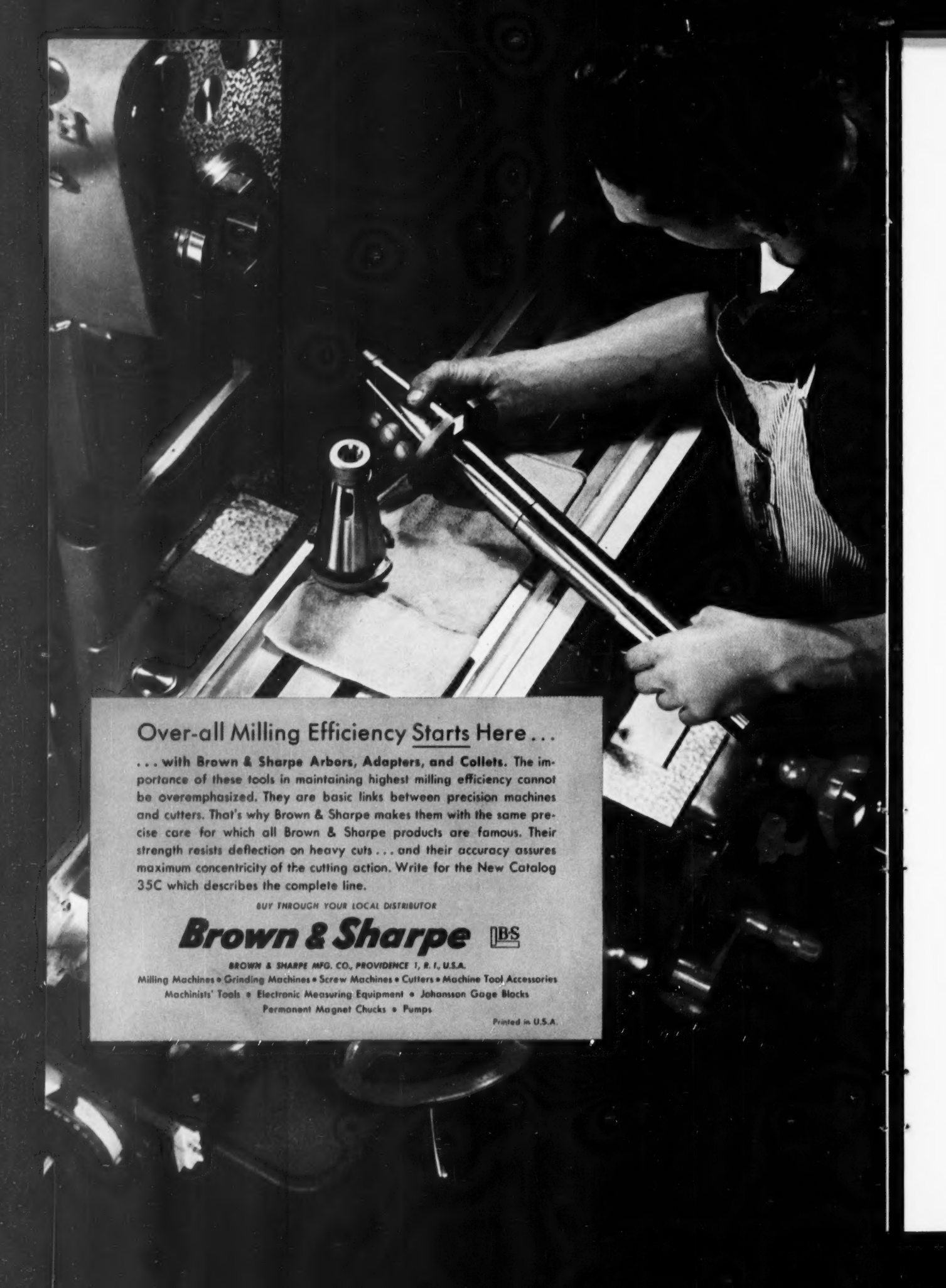


Cut-O-Matic flame-cutting machine made by National Cylinder Gas Co., equipped with new floating torch



Vacuum lift developed for use in handling non-porous metal sheets, made by the Union Tool Corporation


Real
"Cost-Cutters"...
. . . Brown & Sharpe Cutters. The *real* cost of a cutter is measured by its performance and the length of its service life. That's why more shops prefer Brown & Sharpe Cutters. They're expertly made from the finest steels to give you more clean cuts per dollar invested. And, they're available in the widest variety of types and sizes including a complete line of end mills. Write for the New Catalog 35C to help you when ordering.
BUY THROUGH YOUR LOCAL DISTRIBUTOR
Brown & Sharpe



Over-all Milling Efficiency Starts Here . . .

. . . with Brown & Sharpe Arbors, Adapters, and Collets. The importance of these tools in maintaining highest milling efficiency cannot be overemphasized. They are basic links between precision machines and cutters. That's why Brown & Sharpe makes them with the same precise care for which all Brown & Sharpe products are famous. Their strength resists deflection on heavy cuts . . . and their accuracy assures maximum concentricity of the cutting action. Write for the New Catalog 35C which describes the complete line.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

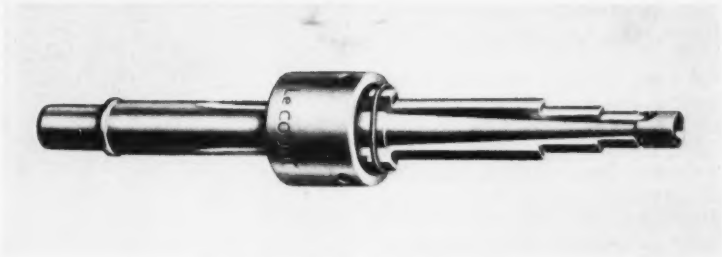
Brown & Sharpe B&S

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U.S.A.

Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks
Permanent Magnet Chucks • Pumps

Printed in U.S.A.

the floor up to 36 inches, and the lift can be adjusted to turn through any angle desired up to 180 degrees. Thus, it can be used to lay the sheet in the desired position in any repetitive operation. The air consumption is approximately 60 cubic feet per cycle. The push-button control can be located conveniently, and can be furnished for automatic cycle operation.



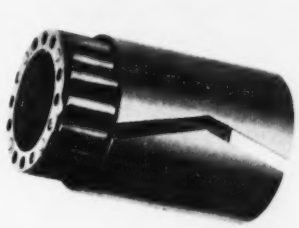
"Count-Centric" expanding mandrel

Expanding Stepped Type Mandrel

A "Count-Centric" expanding mandrel improved to increase its accuracy with respect to size and concentricity has been announced by the Le Count Tool Works Inc., Dept. M, 390 Capitol Ave., Hartford, Conn. This precision-ground mandrel is now available in eleven sizes to accommodate bores from 3/8 inch to 7 inches in size.

Work is held on this mandrel by three keys that slide in grooves on a 3-degree taper. The keyfaces are always parallel, and automatically center the work. The longer gripping surface of the parallel keys prevents marring or distortion in the bore of the work, and permits cuts 1/4 inch deep in tough steel without chattering.

The work can be mounted on the mandrel quickly by a light tap which slides the keys up the 3-degree taper, with a secure grip assured by the precision-finishing of both keys and slots. A tap on the other end of the keys releases the work. The mandrels have two or three steps, the maximum expansion of each overlapping the minimum diameter of the next. Each mandrel overlaps the next larger size, so that any fractional or decimal size bore can be accommodated by the eleven tools.



Rollway bearing with split sleeve

Rollway Roller Bearing with Split Outer Sleeve

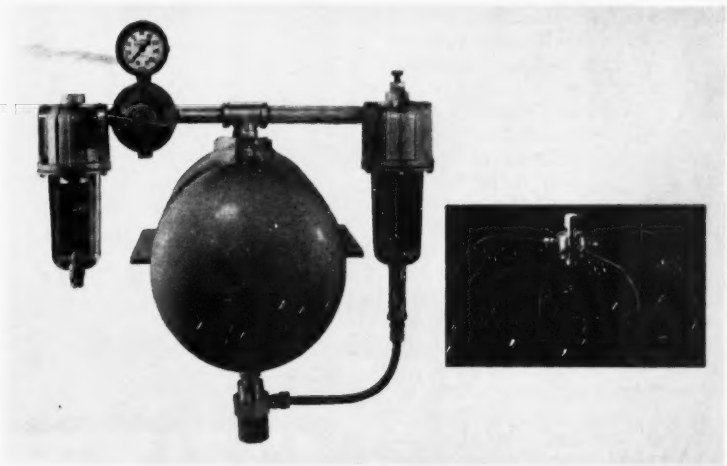
A solid cylindrical roller bearing with steel cage and split outer sleeve is being manufactured by Rollway Bearing Co., Inc., Dept. M, Seymour St., Syracuse, N. Y., subsidiary of the Lipe-Rollway Corporation. This bearing is designed for use on a hardened and ground shaft where space is limited and the housing cannot be hardened and ground to size.

This bearing with its roller assembly and split outer sleeve requires no inner race. Its roller assembly is formed by solid, hardened steel-alloy rollers mounted between two hardened end rings. The hardened split outer sleeve is made of medium carbon, cold-rolled steel strip rolled into a cylindrical form. The ends of the rolled strip are machined, as shown in the illustration, to form an obtuse angle joint. Because of its wide angle, rollers pass over this joint without shock or noise. When the split sleeve is mounted in a housing bore of the correct diameter, it assumes a true cylindrical form and the joint closes to a proper width while the sleeve retains its resiliency, eliminating any tendency to creep in the bore. The bearing is said to be adapted for heavy-duty performance at speeds up to 1000 R.P.M.

"Acro Lo-Jet" Coolant System

A cooling and lubricating unit for metal-cutting tools called the "Acro Lo-Jet," which operates on the expansion-cooling of gas refrigeration principle, is being manufactured by the Air Conversion Research Corporation, Dept. M, 4107 N. Damen Ave., Chicago 18, Ill. The unit illustrated is designed to accommodate up to sixteen cutting operations.

With this equipment, Acro-Coolant is forced into a high-velocity air stream where it is atomized into a fine mist and then directed to the tool through the centrifugal distributor shown in the inset view. The distributor is equipped with high-pressure flexible tubing and nozzles. The solution is cooled below room temperature and thus cools the tool, the jet action carrying away the tool heat and chips.



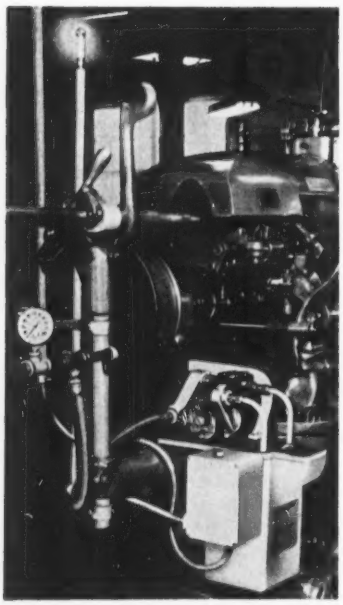
"Acro Lo-Jet" tool cooling and lubricating unit

Hydraulic Screw Machine Feed

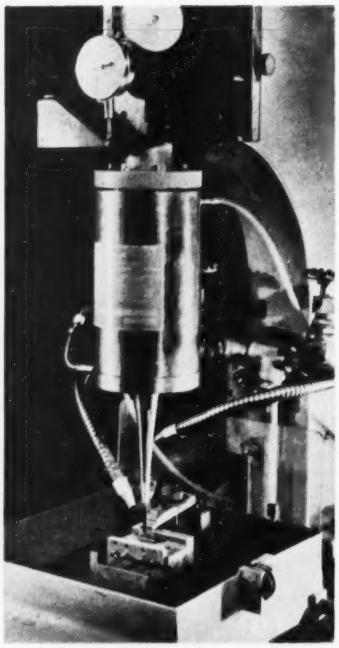
A new, low-cost attachment for feeding screw machine stock has been developed by Aurora Precision Devices, Inc., Dept. M, 318 Anderson Blvd., Geneva, Ill. The "Hydra-Lite" attachment speeds stock handling, and also reduces many subsequent operations since the hydraulic feeding eliminates the use of feed fingers which often score the bars. This makes it possible to feed ground and polished bars without marring the finish.

The feed is a self-contained, independent unit. Each unit is equipped with its own hydraulic pump and oil supply. This eliminates troublesome filters and clogging of collets.

Models are available for all No. 00, No. 0, and No. 2 Brown & Sharpe machines and feed stock from 1/16 inch to 1 1/8 inches in diameter. The average job requires only 20 pounds of oil pressure, which is supplied by the self-contained pump. This pressure will feed piece lengths up to 3 inches but can easily be adjusted to feed up to 5-inch piece lengths. Under the heavier pressures necessary to feed large bars, a metering valve is provided on the No. 2 feed to automatically control the speed of bar travel, thereby eliminating excessive shock and possible damage to turret parts.



Aurora self-contained hydraulic feed unit for use with automatic screw machines



Cavitron machine with ultrasonic vibrating head

Cavitron Machines Made by Sheffield

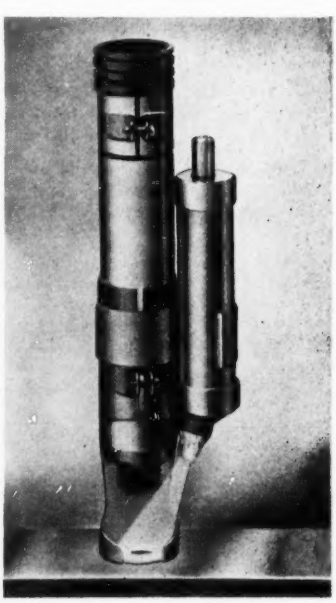
The Sheffield Corporation, Dept. M, Dayton 1, Ohio, is now manufacturing and marketing Cavitron machine tools of the type shown in the illustration, according to a joint announcement of this concern and the Cavitron Corporation, Long Island City, New York. In addition to Sheffield's exclusive distribution rights for the United States and Canada, both concerns will join in marketing the machines abroad. The Cavitron Corporation will continue to produce the ultrasonic transducers and generators, and will issue licenses for the process through the Sheffield Corporation.

The Cavitron machine tool utilizes an ultrasonic vibrating head and an inexpensive tool of soft steel or other metal for the precision cutting of hard and brittle materials. The machine tool will cut materials such as carbides, germanium, hardened tool steels, sintered aluminum oxide, quartz, industrial crystals, ferrites, various types of glass, ceramics, and jewels. It can be used for extremely precise external or internal machining operations such as cutting, drilling, and grinding holes, cavities, slots, and recesses of any shape, as well as the precision forming of external profiles. An extremely fine surface finish is obtained, and there is no local heating of the work surface or chemical or physical change in the work-piece. The high cutting speeds and precision of the Cavitron are made possible by the use of an ultrasonic tool-head vibrating from 18,000 to 30,000 cycles per second.

Brinell Microscope Reader

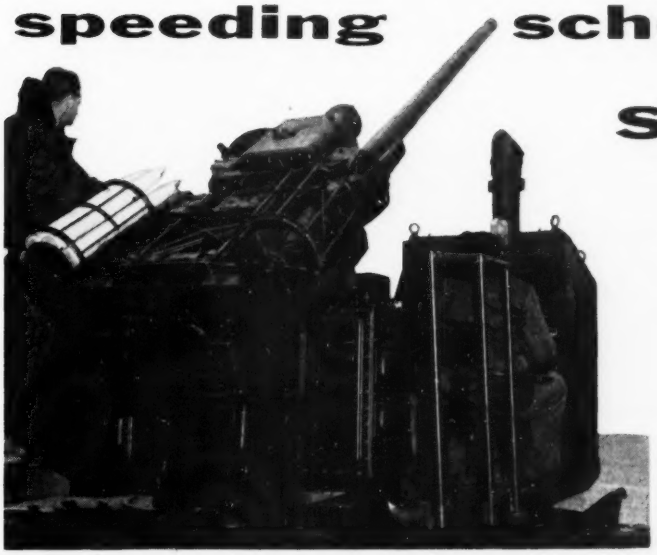
The Pacific Transducer Corporation, Dept. M, 11921 W. Pico Blvd., Los Angeles 64, Calif., has announced a new low-cost Brinell microscope reader for measuring the diameters of indentations made by the ball indentors of all Brinell type hardness testing machines. This microscope reader has a reticle in a flat-field optical system and a self-enclosed concentrated beam of light. It provides a clear image of the indentation made by the hardness tester with the sharp image of the reticle superimposed. The scale is calibrated in millimeters and tenths of millimeters. The total length of the scale is 7.0 millimeters and the diameter of the field of the microscope is 7.5 millimeters.

Concentrated illumination of the indentation field is from a beam of light provided by a battery type illuminator. The Brinell microscope reader has a magnification of 20X.

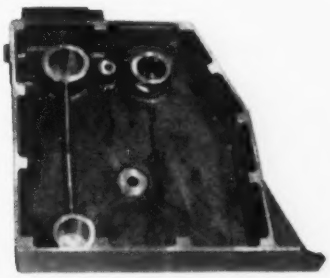


Brinell microscope reader announced by the Pacific Transducer Corporation

BICKFORD SAVES 17% WHILE speeding schedules on Skysweepers



Photos courtesy of American Machine & Foundry Company.

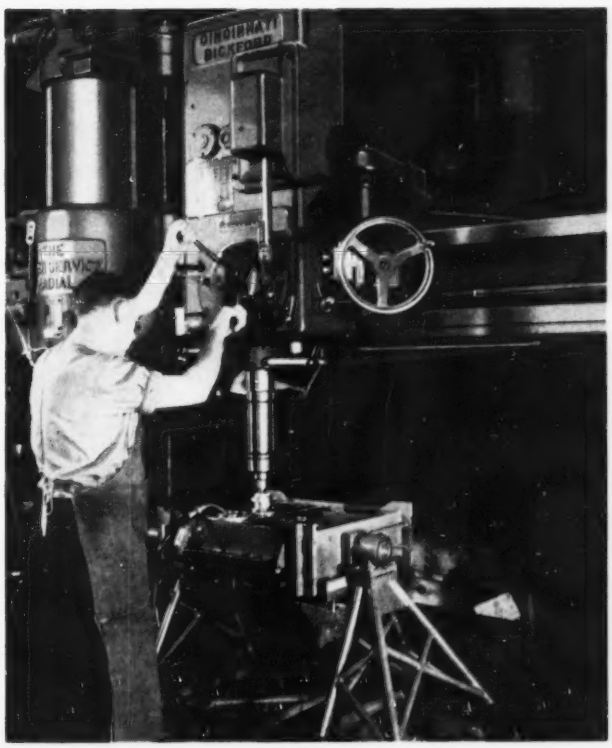


Drilling operations are performed on right and left-hand housings (steel weldments) of the U. S. Army's anti-aircraft "Skysweeper". Time was cut from 3 hours to 2½ hours, and accuracy of bore held within .0006".

The American Machine & Foundry Company states—"We like this machine not only for its performance and ease of handling but because of its flexibility of control, power and ability to stand abuse as well."

This Cincinnati Bickford Super Service Radial effected a 17% saving and speeded schedules. The machine is used to drill and tap, rough bore, finish bore, and ream.

Write for Booklet R-29

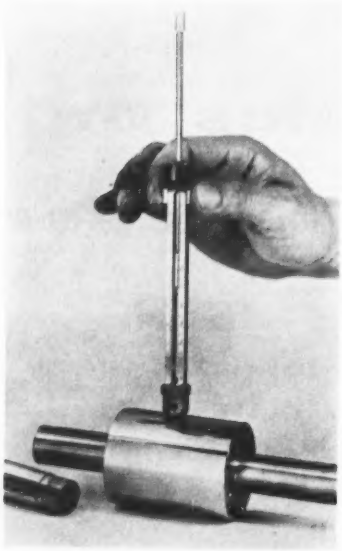


CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.



Testing hardness with Sklerograf introduced by Kurt Orban

Pocket-Size Hardness Testers

A pocket-size Sklerograf hardness tester, believed to be the smallest ever made of the type operating on the rebound principle, is being introduced in this country by the Kurt Orban Co., Inc., Dept. M, 205 E. 42nd St., New York 17, N. Y. This tester is designed to combine low cost and simplicity with consistent accuracy. It is intended specifically for on-the-spot testing.

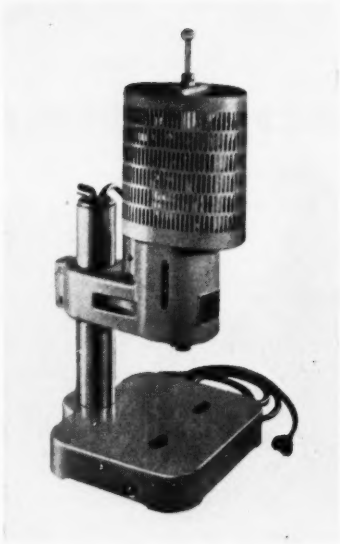
The instrument is placed in a vertical position on top of the article to be tested; the rebounding bar, which carries a hardened steel ball point, is raised until held in place by the locking device. When the locking device is released by pressing a catch, the bar falls and rebounds to a point corresponding to the hardness of the object. Hardness can then be read within an accuracy of 1 point on the Rockwell C scale by noting the position of the indicator ring on the hardness bar against the graduated scale. Conversion tables supplied with the tester permit quick conversion of the scale reading to Shore, Rockwell C, Rockwell B, or Brinell hardness.

Two models are available. The Model M weighs 5 1/4 ounces, including a tubular nickel container, which is 6 1/2 inches long and 3/4 inch in diameter. This model, particularly suitable for use by engineers and metallurgists, leaves no indentation on the surface of material tested, and hence may be used on finished pieces. A somewhat larger type, Model D, is designed to withstand the rougher usage likely to be encountered in shop practice, and is intended chiefly for use by foremen and superintendents. It is 7 1/4 inches long by 1 inch in diameter, and with the container weighs 9 ounces. This model leaves a small indentation on the surface.

Redesigned "Electropunch" Series

Black & Webster, Inc., Dept. N74, 445 Watertown St., Newton 58, Mass., is introducing a redesigned "Electropunch," Series 4, which incorporates improvements in adjustment, operation, and maintenance. It has the same basic dimensions as the previous series and delivers variable impacts up to 3500 pounds at rates of more than 125 blows per minute.

Design changes have been made in the base to give more working surface and a skirt has been added to protect the recessed hand switch from breakage or accidental operation. The adjustable bracket has been strengthened to give the solenoid better support and alignment. This bracket also houses the plunger and return spring, thus providing safety and freedom from dust. The solenoid is enclosed in a perforated steel housing.

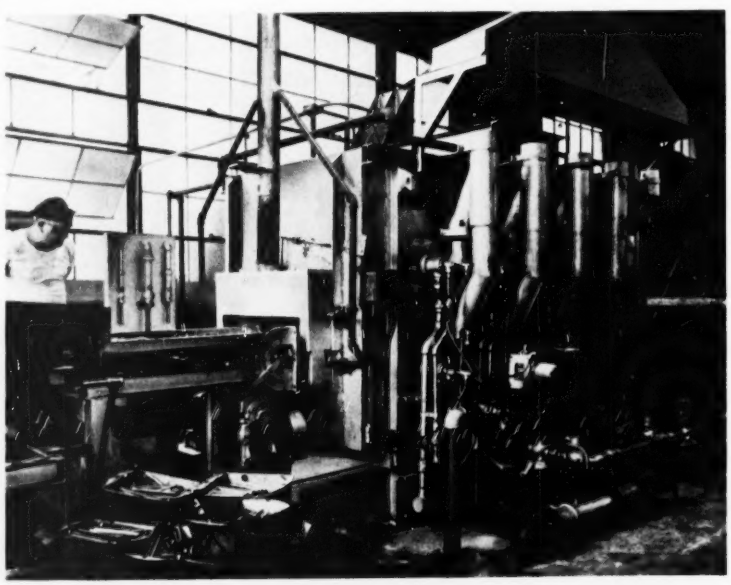


Redesigned "Electropunch" marketed by Black & Webster, Inc.

The "Electropunch" is a bench model unit, weighing 50 pounds, and can be plugged into any electrical outlet. It is economical to operate, since power is consumed only during the impact.

Westinghouse Shaker Hearth Furnace

Small, lightweight parts can be continuously hardened in a radiant-tube, gas-fired, shaker hearth furnace available from the Westinghouse Electric Corporation, Dept. M, Box 2099, Pittsburgh 30,



Westinghouse gas-fired shaker hearth furnace

Users report excellent results with New Sunicut S Oils

In just six months, these unique new straight cutting oils have "Job Proved" themselves as top performers in many metalworking shops all through the industry.

Reports like these keep coming in:

AN AUTO PARTS MANUFACTURER INFORMS US, "Threaded parts are as much as 50° cooler when they come off the machines. And our operators like the clear, clean, odorless qualities of Sunicut 102-S."

SCREW MACHINE SHOPS REPORT, "The versatility of Sunicut 209-S permits us to reduce the number of oils we must stock."

BROWN & SHARPE SCREW MACHINE OPERATORS SAY, "Sunicut 11-S increases tool life, gives finer finishes, eliminates staining problem."

LARGE IMPLEMENT MANUFACTURER TELLS US, "We get better finishes in our broaching operations with Sunicut 110-S, and our operators favor its light color."

Let us show you how these new Sunicut S Oils can help you. For technical bulletins or the services of a Sun representative, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Department M-1.

INDUSTRIAL PRODUCTS DEPARTMENT
SUN OIL COMPANY

SUNOCO

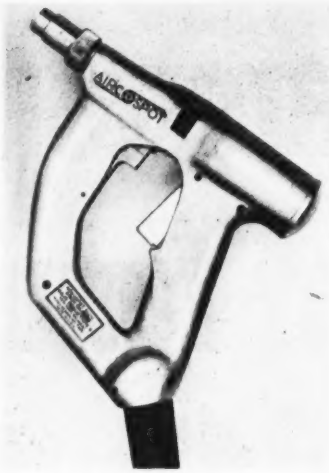
PHILADELPHIA 3, PA. ♦ SUN OIL COMPANY LTD., TORONTO & MONTREAL

For more information on products advertised, use Inquiry Card, page 247

Pa. The furnace has a maximum operating temperature of 1700 degrees F. and is designed for heat-treating medium-carbon, high-carbon, and alloy steels in an "Endogas" atmosphere without scale or decarburization.

In operation, work is loaded on the hearth at the front of the furnace. The reciprocal motion of the shaker charger conveys the parts through the heating chamber and into the quenching fluid. The parts are then automatically conveyed from the quench tank and discharged into tote baskets. A separate stand supports the shaker mechanism so that the furnace receives no shock from the oscillation of the hearth.

Estimated production for this furnace at a 1600-degree F. operating temperature ranges from 400 to 600 pounds per hour. The speed of the work through the furnace is adjusted by varying the operating ratio of the speed reducer, which, in turn, varies the frequency of oscillation of the hearth. Charge space of the hardening zone of the furnace is 30 inches wide, 84 inches long, and 3 inches high. Radiant tubes are installed over and under the shaker hearth. Typical applications include the hardening of pocketknife blades, small flat springs, screws, bolts, etc. The furnace can also be supplied with electrical heating elements.



Water-cooled spot-welding gun made by Air Reduction Sales Co.

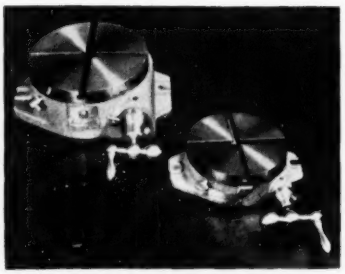
Spot-Welding Gun

The "Aircospot," a new development by the Air Reduction Sales Co., Dept. M, 60 E. 42nd St., New York 17, N. Y., is a lightweight spot-welding gun. It uses a 3/32-inch non-consumable electrode and an inert-gas shield. Instantaneous welds on stainless steel, mild steel, and alloy steel, up to 1/8-inch in thickness, are possible without the aid of jigs or fixtures.

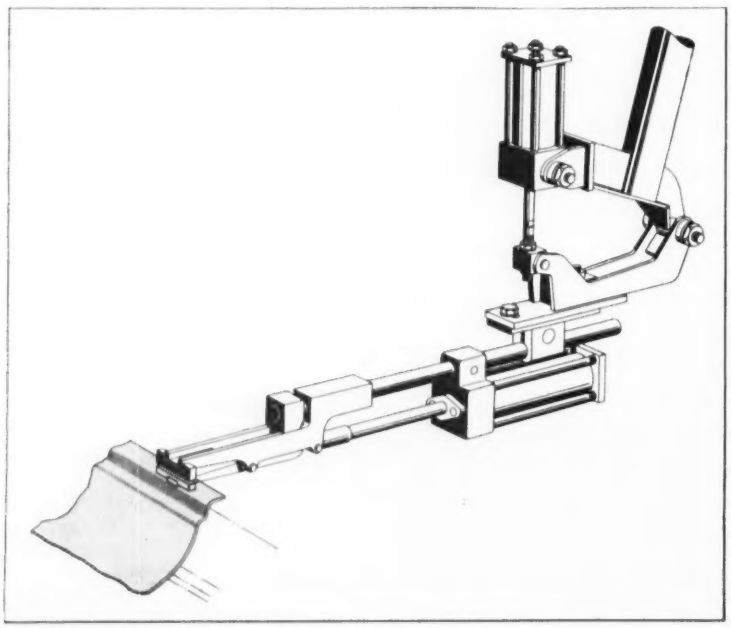
The unit consists of a hand gun, control panel, and all necessary hose and cable assemblies. To use this equipment, which is rated at 250 amperes, a standard direct-current power source—either a motor-generator set or a rectifier type of machine—is required. The gun is water-cooled, and uses either helium or argon (or a mixture of the two) for a shield. High frequency is not required.

Benchmaster Rotary Table

An 8-inch rotary table has been added to the 6-inch line produced by the Benchmaster Mfg. Co., Dept. M, 1835 W. Rosecrans Ave., Gardena, Calif. Both the 6- and 8-inch models illustrated are made low in height in order to obtain greater vertical working space. The 8-inch table measures 3 5/8 inches in height, and the 6-inch table, 2 1/8 inches. The new table has a steel worm mounted on an eccentric which can be engaged or disengaged from the gear to permit freewheeling of the table when desired.



Rotary tables made by the Benchmaster Mfg. Co.



Attachment for Sahlin "Iron Hand" lifts stamping 20 inches before swinging clear

Floating Attachment Added to Sahlin 'Iron Hands"

Automatic unloading of large-area stampings is facilitated by a newly designed attachment, called a "Floating Mechanism," for Sahlin "Iron Hands." It enables the gripping jaw to lift parts 20 inches vertically out of a die before swinging out.

The mechanism was developed by the Sahlin Engineering Co., Dept. M, Birmingham, Mich., and consists of a C-shaped hinged assembly that allows the gripping jaw to pivot at the back. An air cylinder supplies the power for raising the jaw vertically. Standard unloaders provide a normal 4- to 8-inch vertical travel before swinging out.

(Continued on page 250)

Design and Make your own AIR GAGING AND MACHINE CONTROLS

WITH

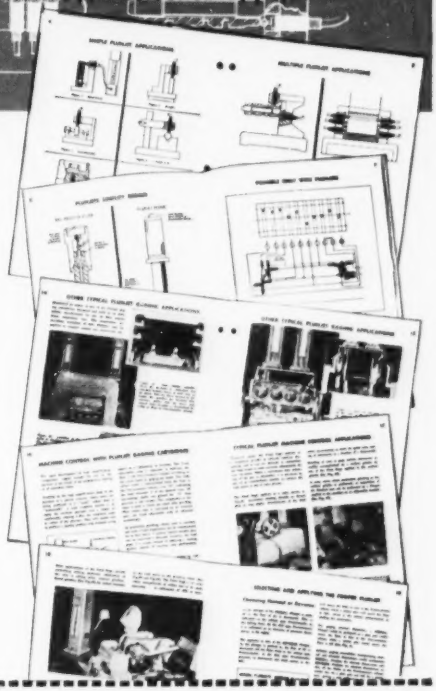
"PLUNJET"

GAGING CARTRIDGES



free booklet tells how

24 PAGES tell how and where you can use PLUNJETS to save thousands of hours and dollars in gaging and machine control applications. Gaging ranges .001 to .080, amplifications 62.5 to 5000 to 1. PLUNJETS are smallest in size, thriftiest to buy, easiest to apply.



"GREATEST ADVANCEMENT IN AIR GAGING SINCE THE INTRODUCTION OF PRECISIONAIRE"

That's what many have said of this "gaging cartridge of 10,000 uses." During the last four years thousands of PLUNJETS have gone into use on a wide variety of gaging and machine control applications. More than five thousand are on gages for checking jet engine blades.

NOW, PLUNJETS ARE AVAILABLE TO YOU—immediate delivery from stock of 36 different ranges, styles and types, at least one of which is suitable for your requirements.

SAVE BY SENDING THIS COUPON NOW for your own copy of PLUNJET ENGINEERING DATA.

GAGE DIVISION, DEPT. 6
THE SHEFFIELD CORPORATION
DAYTON 1, OHIO, U.S.A.

6577

PLEASE RUSH
PLUNJET ENG. DATA

SIGNED_____

POSITION_____

COMPANY_____

STREET_____

CITY_____ ZONE___ STATE_____

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD





ask your tool crib supervisor

Sure you get so fed up with claims and boasts about tools. They all seem plausible enough, but what can you believe? Here's an out! Go check with your tool crib foreman. He'll tell you what air impact wrench is asked for the most. Chances are he'll say "Chicago Pneumatic."

And with good reason, too! The CP-360 above, for example, is well-balanced and a cinch to handle. Designed for faster, low-cost nut running in production line and maintenance, its ease of operation reduces operator fatigue —gets greater work output per operator per day.

Available in seven sizes, CP Air Impact Wrenches are supplied from ¼ to 1¾ inch bolt size in straight and angle head models. Can be had with side, pistol grip or straight handles. *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

For more information on products advertised, use Inquiry Card, page 247

PRODUCT INFORMATION SERVICE

Use postage-free Business Reply Card below for further information
On New Catalogues described in this issue of MACHINERY
On products mentioned in the editorial pages
On products shown in the advertisements

NEW CATALOGUES

PLANT LAY-OUT—Repro-Templets, Inc., Oakmont (Allegheny County), Pa. Catalogue listing an assortment of stock Repro-Templets for laying out machine tool and equipment floor plans in two dimensions. Can be obtained upon company letterhead request direct to the above address.

BAKELITE AND VINYLITE PLASTICS AND RESINS—Bakelite Co., a Division of Union Carbide and Carbon Corporation, New York City. Booklet entitled "1954 Condensed Reference File of Bakelite and Vinylite Plastics and Resins," containing the latest information about more than fifty plastic products, their properties and uses. Available to business firms. 1

HORIZONTAL BORING AND FACING MACHINES—Simmons Machine Tool Corporation, Albany, N. Y. Folder descriptive of two basic types of 6- and 8-inch diameter bar, horizontal boring and facing machines made by the company for the manufacture of steam turbines, Diesel engines, centrifugal pumps, and similar work. 2

PRESS BRAKE DIES, PUNCHING ATTACHMENTS, AND PRESS BRAKES—Verson Allsteel Press Co., Chicago, Ill. Manual containing 112 pages of detailed information on Verson press brake dies and special tooling. All commonly used types of brake dies are covered. Useful engineering data are given. 3

VERTICAL BORING AND TURNING MACHINES—American Steel Foundries, King Machine Tool Division, Cincinnati, Ohio. Catalogue K-1, covering King vertical boring and turning machines in 30-, 36-, and 42-inch sizes; Catalogue K-2, 52-, 62-, and 72-inch sizes; Catalogue K-3, 84- and 100-inch sizes; and Catalogue K-4, 120- and 144-inch sizes. 4

PHOTOELECTRIC RELAYS—General Electric Co., Schenectady, N. Y. Bulletins GEA-5920 and GEA-5921, featuring two new photoelectric relays, one rated at 450 operations per minute and the other at 600, for use in many applications of counting, sorting, indicating, and controlling. 5

HYDRAULIC PRESSES—Hydraulic Press Mfg. Co., Mount Gilead, Ohio. Bulletin 5004-A, featuring the company's complete line of presses for the metal-working and process industries, die-casting, and plastics molding. Each type of press is briefly described. 6

STRANDED ELECTRODES—Air Reduction Sales Co., New York City. Reprint entitled "Stranded Electrode Materials for Aircomatic Welding," considering the use of stranded wires in the inert gas-shielded metal-arc consumable electrode Aircomatic welding process. Case histories are given. 7

SURFACE FINISH—Brush Electronics Co., Cleveland, Ohio. Booklet ED-21703, on the subject of how surface finish control can reduce machining costs and increase production capacity. The Surfindicator, a shop tool for measuring surface roughness, is described. 8

CUTTING FLUID DILUT-O-GRAPH—D. A. Stuart Oil Co., Ltd., Chicago, Ill. Folder containing two handy aids for the selection and use of cutting and grinding fluids: a cutting and grinding fluid selector and a Dilut-O-Graph, with instructions for their use. 9

INTERNAL COMPARATORS—Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn. Booklet describing the Electrolimit internal comparator, a precision measuring instrument designed to accurately gage the internal diameters of parts. 10

HYDRAULIC PRESSES—Lake Erie Engineering Corporation, Buffalo, N. Y. Bulletin 10-1, covering a wide variety of presses for bending and straightening applications, in gap type models, traveling head models, and column and side plate units. 11

DIEMAKER SPRINGS AND SET-SCREWS—Producto Machine Co., Bridgeport, Conn. Supplement to the No. 10 catalogue, containing revised prices for the company's line of diemaker springs; also price supplement covering set-screws and stripper bolts. 12

CORRECTION CHART FOR HARDNESS OF ROUNDS—Wilson Mechanical Instrument Division, American Chain & Cable Co., Inc., New York City. Wilson pocket-size chart indicating corrections to be added to Rockwell hardness numbers obtained on cylindrical surfaces. 13

VINYL DISPERSION RESINS—Bakelite Co., a Division of Union Carbide and Carbon Corporation, New York City. Booklet VE, on typical uses, properties, and methods of applying Bakelite vinyl resin-base organosol and plastisol dispersion resins. 14

HARD-FACING—Air Reduction Sales Co., New York City. Reprint entitled "Selection and Evaluation of Methods of Hard-Facing," in which the application of hard-facing materials is discussed, with emphasis on the inert-gas shielded-arc process. 15

AXONOMETRIC DRAWING—John R. Cassell Co., Inc., New York City. Catalogue entitled "3 Dimensional Drafting," illustrating "Instrumaster" implements used in axonometric drawing, as well as technically treating the subject of three-dimensional drawing. 16

TEMPERATURE CONTROL SYSTEMS—Wheelco Instruments Division, Barber-Colman Co., Rockford, Ill. Bulletin F-6149, on temperature control systems—where to use each system and what Wheelco instruments are required for the best control results. 17

SINGLE-STAGE TURBINE—De Laval Steam Turbine Co., Trenton, N. J. Bulletin 4206, containing design features, dimensions, and performance data on the new De Laval HCB single-stage turbine designed for a variety of plant operations. 18

ROLLING MILL AUXILIARY EQUIPMENT—Lake Erie Engineering Corporation, Buffalo, N. Y. Bulletin 50-1, outlining the company's expanded facilities for designing and manufacturing rolling mill auxiliary equipment for ferrous and non-ferrous metals. 19

CARBIDE-TOOL GRINDING—Sterling Abrasives Division of the Cleveland Quarries Co., Tiffin, Ohio. Folder announcing the availability of two types of carbide-tool grinding units—the new Sterling plate-mounted wheel, and the Easymount end wheel. 20

INDUSTRIAL CLEANING—Oakite Products, Inc., New York City. Plant Maintenance Digest, describing fifty-four typical jobs in factories and mills on which Oakite cleaning materials and methods are being used to get improved results. 21

OSCILLOGRAPHS—General Electric Co., Schenectady, N. Y. Bulletin GEC-449B, describing a general-purpose oscillograph for use in investigation, design, and testing of many types of machines and devices. 22

SILICONE RUBBER PRODUCTS—Garlock Packing Co., Palmyra, N. Y. Bulletin AD-147, describing many of the silicone rubber products made by the company, pointing out features of silicone rubber, and giving examples of typical applications. 23

AIR GAGE—Federal Products Corporation, Providence, R. I. Catalogue 53B, describing the Federal Dimensionair, an air gage with a measuring range of 0.003 inch on a 2500 to 1 magnification, and illustrating various gaging applications. 24

DIAMOND TOOLS AND WHEELS—A.I.T. Diamond Tool Co., Chicago, Ill. Catalogue 1054, describing the company's line of diamond tools and wheels. Correct applications of diamond wheels are considered, and a conversion table included. 25

A-C MOTOR FRAME SELECTION CHART—Westinghouse Electric Corporation, Pittsburgh, Pa. Wall chart showing the comparison between "old" and "new" NEMA standard dimensions for alternating-current motors from 1 to 30 H.P. 26

FIRST CLASS
Permit No. 58
(Sec. 34.9, P. L. & R)
New York, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY—

MACHINERY
148 LAFAYETTE STREET
NEW YORK 13, N. Y.

READERS' SERVICE DEPT.

BRUSH PRODUCTS—Brush Electronics Co., Cleveland, Ohio. Folder showing the manufacturing facilities of the company, as well as some of the instruments, acoustic products, and magnetic recording equipment made at Brush. 27

GEAR-MOTORS—Westinghouse Electric Corporation, Pittsburgh, Pa. Booklet B-5645, describing the complete line of Westinghouse Life-Line gear-motors. Gear ratios for single-, double-, and triple-reduction types are given. 28

APRON CONVEYORS—Link-Belt Co., Chicago, Ill. Folder 2470, describing new Link-Belt piano-hinged apron conveyors designed to handle sharp, highly abrasive, and hot materials; machine parts; and similar products. 29

BEARINGS—Thomson Industries, Inc., Manhasset, N. Y. Folder descriptive of standard thin-wall Nylined bearings for rotation and reciprocation, explaining operating principles and supplying application data. 30

INDUSTRIAL STEREOMICROSCOPE—Bausch & Lomb Optical Co., Rochester, N. Y. Catalogue descriptive of the Bausch & Lomb steremicroscope, an optical instrument having a three-dimensional factor specifically designed for industrial applications. 31

DUST COLLECTORS—Vulcan Tool Co., Dayton, Ohio. Folder describing Vulcanaire individual dust collecting units, and showing various grinders that have been equipped with dust collectors. 32

DRILL STOP-CHUCK—Wohlnip Engineering Co., Hillside, N. J. Folder descriptive of Wohlnip non-rotating drill stop-chucks in a straight shank type, taper shank type, and a type for automatics. 33

DRILLING MACHINE—Hamilton Tool Co., Hamilton, Ohio. Bulletin V-53, showing construction features of the Hamilton Varimatic variable-speed drilling machine for the production-drilling of small holes. 34

RESIN COATINGS—Bakelite Co., a Division of Union Carbide and Carbon Corporation, New York City. Folder VG, reporting case histories of coatings based on Bakelite resins for general industry. 35

VERTICAL MILLING ATTACHMENT—Cincinnati Milling Machine Co., Cincinnati, Ohio. Leaflet M-1766, descriptive of a heavy-duty vertical milling attachment for use on the larger Cincinnati plain and universal milling machines. 36

TURRET INDEXING UNITS—Swanson Tool & Machine Products, Inc., Erie, Pa. Swanson turret indexing units (Series T) for drilling, punching, soldering, staking, and many other light manufacturing operations on small and medium parts. 37

INSPECTION UNIT—Swanson Tool & Machine Products, Inc., Erie, Pa. Folder descriptive of the Swanson V-liner inspection unit for concentricity checking and inspection in machine shops and tool-rooms. 38

MACHINE TOOLS—Reed-Prentice Corporation, Worcester, Mass. Catalogue containing descriptive circulars of Reed-Prentice engine lathes, toolroom lathes, and vertical milling machines. 39

BENCH TYPE MILLS—Barker Engineering Co., Cleveland, Ohio. Circular BM 9-53, featuring Barker bench type mills with three-way hand lever travel, for the rapid production machining of small parts. 40

REAMERS—Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn. Circular 563, on Pratt & Whitney Blue Helix reamers in taper, shank and straight shank types. 41

TUNGSTEN-CARBIDE COMPONENTS — Sintercast Corporation of America, Yonkers, N. Y. Booklet illustrating a variety of shapes, sizes, and forms of tungsten-carbide components manufactured by the company in accordance with customers' specifications. 42

HYDRAULIC METAL-WORKING PRESSES—Elmes Engineering Division, American Steel Foundries, Cincinnati, Ohio. Bulletin 1010-B, illustrating the complete line of Elmes hydraulic metal-working presses. 43

LINEAR BALL BEARINGS—Thomson Industries, Manhasset, N. Y. Catalogue descriptive of Thomson ball bushings, ball bearings designed for linear motions only. Installation data are given. 44

FORMED METAL PRODUCTS—C. B. Kaupp & Sons, Maplewood, N. J. Bulletin describing and illustrating the company's facilities for producing metal components by metal spinning, deep-drawing, Hydroforming, and stamping. 45

DIE HEADS—Landis Machine Co., Waynesboro, Pa. Bulletin F-80-5, on Landis hardened and ground threading heads for application to turret lathes, automatic screw machines, and threading machines. 46

SWITCHBOARD INSTRUMENTS—General Electric Co., Schenectady, N. Y. Bulletin GEC-218C, descriptive of long-scale switchboard instruments that are intended for general switchboard service. 47

POWER SHEARS—Cleveland Crane & Engineering Co., Wickliffe, Ohio. Catalogue 2011-E, covering Steelweld pivoted-blade power shears, and giving dimensions and specifications for thirty-one sizes. 48

MILLING CUTTERS—DoAll Co., Des Plaines, Ill. Catalogue presenting a complete line of cutters for milling machines. Helpful information on the proper application of cutters and saws is provided. 49

GEAR SPEEDERS—Michigan Tool Co., Detroit, Mich. Bulletin MS-10, covering the company's four models of gear speeders for gear inspection—operation, control, and specifications. 50

ULTRASONIC CLEANING—General Electric Co., Schenectady, N.Y. Bulletin GEA-6056, explaining how the G-E ultrasonic generator works, the principles of high-frequency sound cleaning, and example of present applications 51

CHART FOR ADJUSTING SHIM TYPE CLUTCHES—Lipe-Rollway Corporation, Syracuse, N. Y. Service chart describing eight important steps for adjusting shim type clutches. 52

MANDRELS AND C-CLAMPS—Le Count Tool Works, Inc., Hartford, Conn. Folder covering the company's line of Count-Centric expanding mandrels and Thor-aloy drop-forged C-clamps. 53

TIME SWITCHES—General Electric Co., Schenectady, N. Y. Catalogue GEA-5965, containing selection and application information on the complete line of G-E time switches, process timers, and time meters. 54

SURFACE PLATES—Bryant Chucking Grinder Co., Springfield, Vt. Leaflet describing Bryant granite surface plates for precise measurements in layout, inspection, and assembly work. 55

WIRE STRAIGHTENING AND CUTTING MACHINES—Mettler Machine Tool, Inc., New Haven, Conn. Bulletin 37V, on two dual control Shuster wire straightening and cutting machines. 56

PROFILE-TRACING LATHE ATTACHMENT—Lehigh Foundries, Inc., Easton, Pa. Folder descriptive of the Lehigh Pro-Tracer, giving examples of duplicating work done with this profile-tracing engine lathe attachment. 57

DRILL CHUCKS—Kurt Orban Co., Inc., New York City. Folder descriptive of the new May automatic quick-change drill chuck. The working procedure is explained. 58

CENTERLESS LAPPING MACHINES—Size Control Co., Chicago, Ill. Bulletin L-53, describing the company's line of centerless lapping machines and explaining the centerless lapping process. 59

UNIVERSAL TESTING MACHINE—Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa. Bulletin 4206, descriptive of the SR-4 universal testing machine of 50,000-pound capacity. 60

AIRCRAFT AND ORDNANCE MOTORS—General Electric Co., Schenectary, N. Y. Bulletin GEC-988, containing photographs and diagrams of aircraft and ordnance motors. 61

CARBIDE TOOLS—Adamas Carbide Corporation, Harrison, N. J. Catalogue T-53, listing Adamas standard carbide-tipped tools in eleven styles. 62

AIRCRAFT LAUNCHING AND ARRESTING EQUIPMENT—E. W. Bliss Co., Canton, Ohio. Booklet illustrating Bliss facilities for producing aircraft launching and arresting equipment. 63

GEAR RACKS—Worcester Gear Works, Inc., Worcester, Mass. Folder showing various types of gear and rack applications. 64

CARBIDE DIES—Adamas Carbide Corporation, Harrison, N. J. Bulletin D-53, consisting of a supplement to Bulletin D-749 on wire bar and tube drawing dies. 65

INDUSTRIAL FILTERS—Murray-Way Corporation, Birmingham, Mich. Leaflet outlining the technical operation of the Murray-Way industrial filter. 66

SHEARS—O'Neil-Irwin Mfg. Co., Lake City, Minn. Booklet consisting of a guide to aid in the selection and operation of DiAcro shears. 67

INDUSTRIAL CLUTCHES—Formsprag Co., Van Dyke, Mich. Bulletin 1-3, consisting of case histories on sprag type clutches. 68

Product Information Service

Use postage-free Business Reply Card below for further information concerning New Catalogues described in this issue and products mentioned in the editorial pages or advertisements.

Circle numbers of the catalogue items in which you are interested.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68							

For more details on products mentioned in the editorial pages or shown in the advertisements in this issue, fill in below:

PAGE .....PRODUCT .....

PAGE .....PRODUCT .....

Please print your name and address

YOUR NAME .....TITLE .....

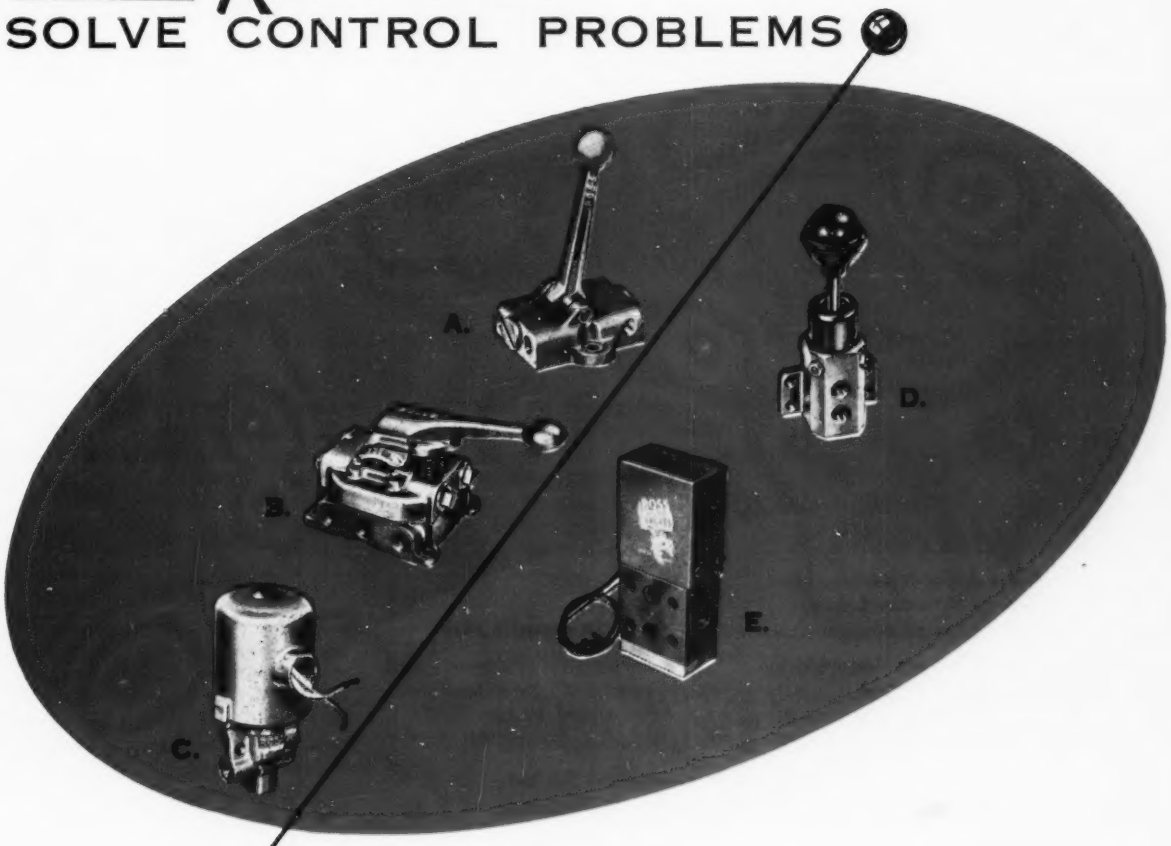
COMPANY .....

CO. ADDRESS .....

CITY .....ZONE.....STATE.....

This card is void after April 1, 1954 M-1/54

SMALL *Ross* VALVES SOLVE CONTROL PROBLEMS



Ross makes hundreds of valves especially designed for small, fast, single or double acting cylinder applications on all types of machine tools, jigs, fixtures, small punch presses and for remote pilot operation of large valves.

A. 600 series—three-way or four-way—hand and foot—¼" pipe—horizontal or vertical handle—single or double treadle.

B. 880 series—three-way or four-way—hand and foot—¼" and ⅜" pipe—horizontal or vertical handle—single or double treadle.

C. Inline direct operated solenoid — straight-way and three-way — normally open and normally closed —⅛" pipe.

D. Straight-way or three-way normally closed — ¼" pipe — various heads.

E. Four-way direct operated solenoid—¼" pipe—can be converted to three-way by plugging cylinder port.

Large or small—Ross has the most complete line of operating valves in the industry. Ask Ross for any air control information.

ROSS Control VALVES

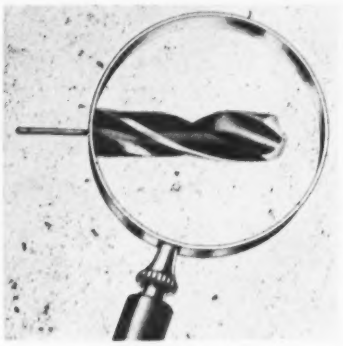
Ross CONTROL

OPERATING VALVE COMPANY

110 E. GOLDEN GATE AVENUE • DETROIT 3 • MICHIGAN

Small-Size Drills

Whitman & Barnes, Dept. M, Plymouth, Mich., is now manufacturing small-size drills in the range of 0.15 millimeter (0.0059 inch) to 1/16 inch that are said to have consistently accurate cutting points. The drill flutes are ground from solid heat-treated blanks, resulting in a uniform, close-tolerance tool that is not distorted by subsequent heat-treatment.



Small-size drill with precision point made by Whitman & Barnes

At the same flute-grinding operation, the drill is point-ground without removing it from its holder, so that the cutting lips always bear the correct relation both to the flutes and to the axis of the drill. This provides the high degree of concentricity essential for precision micro drilling.



(Right and Left) Tension and compression load cells in the new series announced by Baldwin-Lima-Hamilton Corporation

Baldwin Load Cells

Two series of "precision" and "extra precision" type load cells have been added to the Baldwin SR-4 line for measuring forces and weights. The series, manufactured by the Baldwin-Lima-Hamilton Corporation, Dept. M, Philadelphia 42, Pa., include eighteen compression load cells in nine capacities ranging from 500 to 200,000 pounds, and sixteen tension load cells of eight capacities from 500 to 100,000 pounds.

These cells are mechanically and electrically interchangeable with standard cells—that is, they have the same nominal resistance, their voltage output at rated capacity is the same, and cells of a given capacity have the same physical dimensions.

Applications of SR-4 load cells for electrical weighing include static weighing of storage tanks and hoppers, conveyors, aircraft, trucks, locomotives, and freight cars. Thrust measurement of turbo-jet, ram-jet, turbo-prop, and powdered and liquid fuel rocket propulsion systems have been made by this equipment.

Drip-Proof and Explosion-Proof Motors

The Louis Allis Co., Dept. M, Milwaukee 7, Wis., has recently placed on the market a line of electric motors in open drip-proof, totally-enclosed fan-cooled and explosion-proof enclosure types in ratings from 1/2 H.P. at 900 R.P.M. up to 40 H.P. at 3600 R.P.M. These motors are built in accordance with the new NEMA frame size standards, and the smaller frame sizes will also be available. This L.A. line features modern styling, improved ventilation, greater protection, a new conduit box arrangement, better bearing construction, and more versatile mounting.

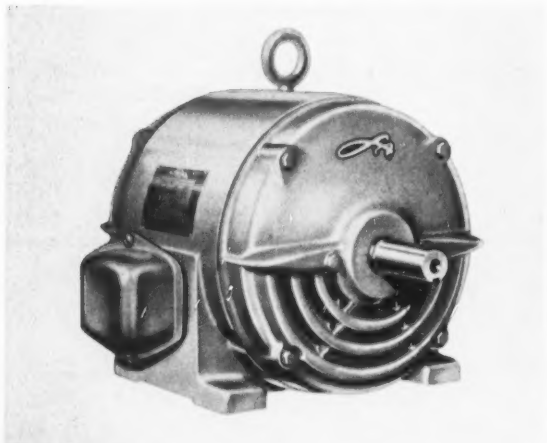


Fig. 1. Louis Allis open drip-proof, totally-enclosed fan-cooled motor

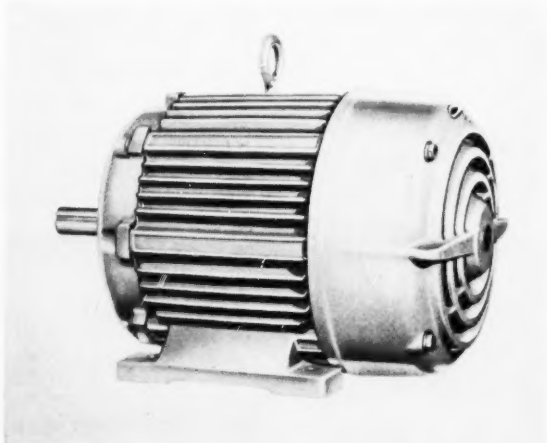


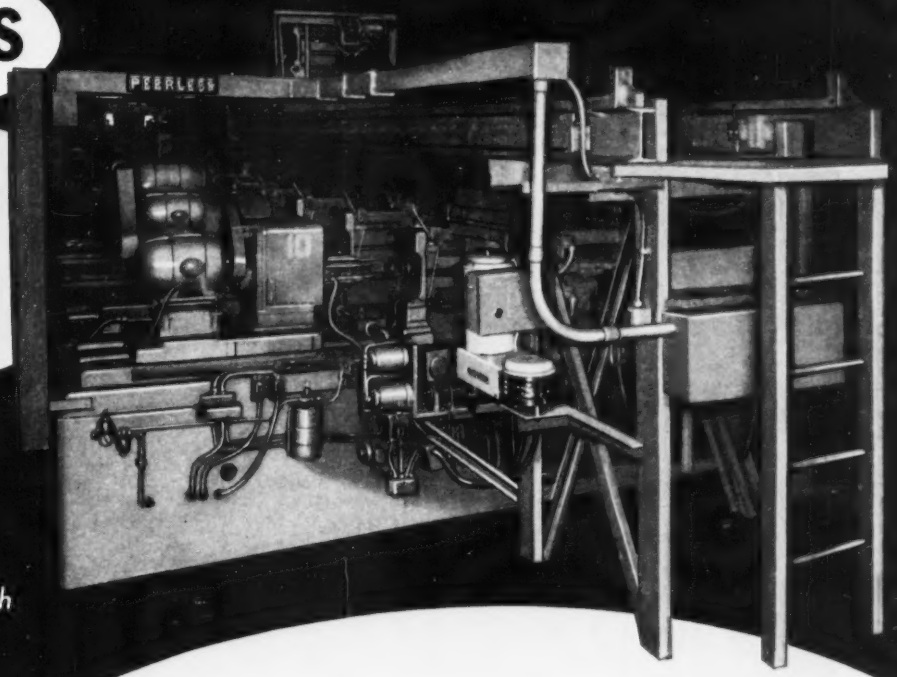
Fig. 2. An explosion-proof enclosure type of L.A. electric motor

(*This section continued on page* 266)

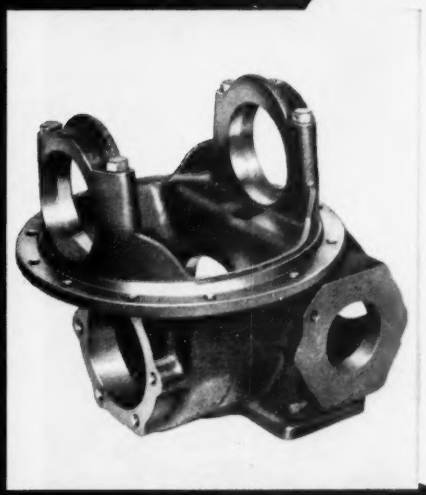
PEERLESS

EXCELLENT ENGINEERING

that does the Never-Before, ***NOW***



like the precision work by this transfer machine which replaced an entire department



Before this PEERLESS, an entire department was employed to process various differential carriers.

Now, this PEERLESS takes these raw cast carriers . . . roughs and finishes them . . . and then completes rough-and-finished boring and facing operations, as well as drilling and tapping—

And still holding precision boring and facing tolerances!

Yet this PEERLESS retains the flexibility of an individual-operation setup!

See other examples of PEERLESS Engineering Excellence that does the *Never-Before, NOW!*

Part and Production: Differential Carrier for heavy truck axle. 40 pieces per hour at 100% efficiency.

Type of Equipment: 8-Station Transfer Machine with 5 working, 1 load and unload, and 2 idle stations, utilizing a hydraulically-actuated transfer mechanism for pallet movement. Power-operated overhead pallet-return conveyor and elevators. Peerless 17"-way floor-type Hydraulic Feed Unit. Peerless hydraulically-actuated Bore Face Unit. Colored-light Operator Control Board.

Tooling: Single-place pallet fixtures with automatic positive positioning. Hydraulically-actuated boring and facing heads. Fixed-center ball-bearing drill heads and individual lead-screw tapping heads.

WRITE TODAY FOR **FREE** 24-PAGE CATALOG

PEERLESS PRODUCTION CO.

19449 GLENDALE AVE. • DETROIT 23, MICH.

Gentlemen: Please send me your catalog.

Name_____

Title_____

Firm_____

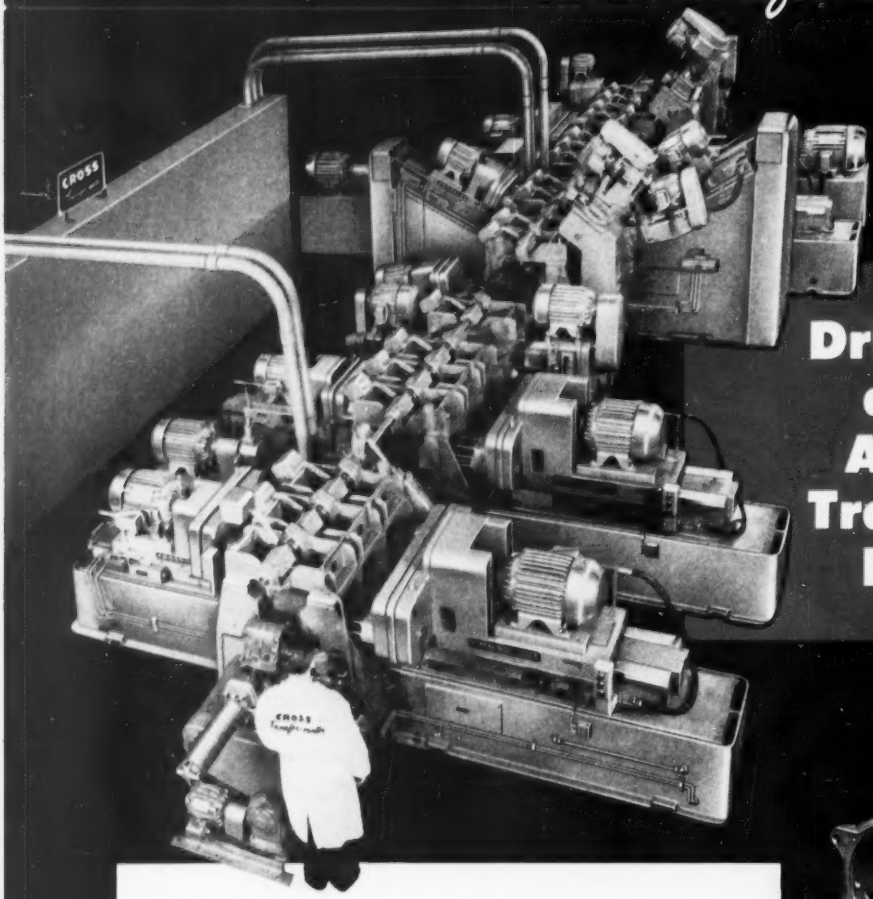
Street Address_____

City_____ Zone____ State_____

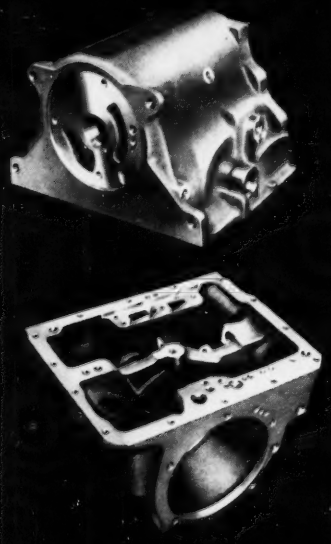
PEERLESS

SPECIALIZED PRODUCTION EQUIPMENT

Another Transfer-matic by Cross



Drills, Reams and Taps Automatic Transmission Housings



- ★ 29 stations.
- ★ 78 operations—30 drilling, 12 chamfering, 4 end milling, 3 counterboring, 14 reaming, 15 tapping.
- ★ 100 pieces per hour at 100% efficiency.
- ★ Automatic 90° indexing of part in station 14 for drilling sides and top in subsequent stations.
- ★ Pre-set tools and Cross Machine Control Unit with Toolometers for programming tool changes.
- ★ Complete interchangeability of all standard and special parts for easy maintenance.
- ★ Other features: Automatic transfer from station to station; hydraulic feed and rapid traverse; individual lead screw feed for tapping; hardened and ground ways; gravity operated cam clamping; J.I.C. standard construction; built-in chip conveyor.

Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

For more information on products advertised, use Inquiry Card, page 247



Between Grinds

By E. S. Salichs

So There!

Electronic machines have been conceded to be so smart in performing complex functions that it is with a certain relief that we read what the president of the Battelle Memorial Institute, Clyde Williams, has to say about them: "Although able to perform routine information hunting with high speed, excellent precision, and unwavering patience, the machine will, in fact, be a moronic robot."

Success Story

A young man had been working for several weeks in the machine shops of a large corporation. He was then called in for an interview with the president. "Young man," said the big-wig, "how much are you earning here?" "$45 a week, sir," the beginner replied. The president continued, "We have been watching you closely, and are satisfied with your progress. Starting Monday, you will be promoted to vice-president and your salary will be $450. What have you to say to that?" "Thanks, Dad," was the answer.

A Rustling Address

"Engineers Can Wear Petticoats" was the subject of a recent talk by an assistant professor of mechanical engineering at the Illinois Institute of Technology. The speaker, Mrs. Lois G. McDowell, knows her flounces —she was the first woman to receive a master's degree in mechanical engineering at Illinois Tech.

Tricks on the Trek

Onan on Safari is a booklet written by Commander Attilio Gatti describing his twelfth expedition to Africa, a project to produce commercial films, on which he carried four Onan electric power plants. The equipment established at the base camp, natives dropped their voodoo like magic to hear their voices and songs captured on tape recorders. One fatality occurred—a Zulu mouse got caught in a control box.

In His Cups, or Cup

Then there was the chap who arrived at the office during the holidays with a bruise on his forehead—not received in combat. He had merely been demonstrating to his young daughter a novel use for a suction cup play toy.

Felicitations!

The Quarter Century Club was recently inaugurated at The Bullard Company, Bridgeport, Conn., with 219 charter members—their combined service mounting to 6856 years. Gold watches were the order of the day, or evening —since the event was celebrated at a dinner.

CURRENT AUTHOR—Blaine B. Ramey, writing on portable electric tools in this number, page 173. Mr. Ramey was born in Washington, D. C., and was graduated from Cornell University in 1910 with a degree in mechanical engineering. He worked for the Crocker-Wheeler Mfg. Co. for three years, and the Westinghouse Electric Corporation for twelve years. Then he began his long career with the Black & Decker Mfg. Co., Towson, Md., maker of portable electric tools. He started as electric engineer, in turn becoming a consulting engineer, research sales engineer, and presently, research engineer. Mr. Ramey lives in Towson and has two sons and a grandson. The story goes that when his family was in a quandary as to what to get Dad for Christmas, a clerk suggested surprising the gentleman with the latest hobby, a workshop. No, said the family, he's a gardener.



News OF THE INDUSTRY

California and Texas

PASADENA HYDRAULICS, INC., Pasadena, Calif., has acquired PRECO, INC., Los Angeles, Calif., manufacturer of bench type hydraulic presses. The Preco press has been renamed the "Phi" press, and is being manufactured at the Pasadena plant.

PRATT & WHITNEY DIVISION NILES-BEMENT-POND CO., West Hartford, Conn., manufacturer of cutting tools and gages, announces that the Los Angeles branch office has moved to new, larger quarters at 3016 E. Olympic Blvd., Los Angeles 23, Calif. DARYL W. CALLEN will serve as district manager.

S. V. V. HOFFMAN has been appointed West Coast sales district manager of Raybestos-Manhattan, Inc., Passaic, N. J., with headquarters in Los Angeles. Mr. Hoffman will supervise sales in Los Angeles and San Francisco, Calif., and Seattle, Wash.

ASA FARRELL, superintendent of Lyco Machine Works, Oakland, Calif., has been promoted to the post of works manager, while JAMES MCKAY, JR., has been appointed sales manager.

J. A. JEAN has joined the Fray Machine Tool Sales Corporation, Glendale, Calif., in the capacity of sales manager.

J. N. HOLLAND has been appointed sales engineer for the Meter and Valve Division of the Rockwell Mfg. Co., Pittsburgh, Pa., covering most of east Texas. The territory was formerly handled by KENNETH REMBERT, who is concentrating on southeastern Texas.

J. G. HUDSON, JR., has been named field engineer for the Cleco Air Tool Division of the Reed Roller Bit Co., Houston, Tex., in the Dallas, Fort Worth, and west Texas areas, and New Mexico.

Connecticut, Massachusetts, and Rhode Island

WALTER C. THOMPSON, executive vice-president of the Torrington Co., Torrington, Conn., has been elected president, succeeding the late Lester J. Ross. Mr. Thompson has been affiliated with Torrington since 1927. He was elected secretary of the company in 1942, and four years later was made vice-president in charge of all sales. The post of executive vice-president he had held since last September. RAY B. NICHOLS, vice-president in charge of sales, succeeds Mr. Thompson as executive vice-president. Mr. Nichols had been president of the Bantam Ball Bearing Co., South Bend, Ind., since 1947. He was transferred to the parent company at Torrington last fall to assume the post he held at the time of his promotion. BYRON T. VIRTUE, chief engineer in the Bearings Division, has been promoted to general sales manager. He has been with the company since 1945.

RICHARD L. ALLEN has been appointed general sales manager of the Bridgeport Brass Co., Bridgeport, Conn. Mr. Allen joined Bridgeport Brass in 1937. He replaces the late Chester M. Adams.

W. C. O'CONNELL has been made general manager of the Aircraft Gas Turbine Department of the General Electric Co., Lynn, Mass. Prior to his appointment, Mr. O'Connell was on special assignments at the Aircraft Gas Turbine Division in Cincinnati, Ohio. He has been with the company since 1935. Mr. O'Connell has named five section managers for his department: C. R. PLUM, manager of marketing; H. J. SERVICE, manager of manufacturing; C. A. NEWMAN, manager of employe and plant community relations; D. J. WAIT, manager of finance; and W. O. MECKLEY, manager of engineering.

NORTON CO., Worcester, Mass., has appointed DAVID REID, JR., manager of its abrasive and bond plants. Mr. Reid replaces ALBERT E. HALL, who retired recently. ROBERT G. CLARKE assumes the post that Mr. Reid vacated, superintendent of the plants mentioned.

BROWN & SHARPE MFG. CO., Providence, R. I., announces the following administrative appointments: WILLARD H. SPENCE, assistant to vice-president, sales; and EARL P. LEEDS, general sales director of domestic machine tool sales. JAMES MEEHAN, sales director, has assumed responsibility for domestic milling machine sales, in addition to domestic grinding machine sales.

LEONARD J. EDWARDS has been appointed vice-president in charge of sales for C. I. Hayes, Inc., Providence, R. I., manufacturer of electric heat-treating equipment.





(Left) Walter C. Thompson, new president of the Torrington Co.; and (right) Ray B. Nichols, executive vice-president

Illinois and Indiana

ANDERSON BROS. MFG. CO., Rockford, Ill., announces that SWAN F. ANDERSON, president since 1916, has been named chairman of the board of directors. He is succeeded as president by RALPH F. ANDERSON, formerly secretary-treasurer, who will

Smith & Mills SHAPERS

Rugged power for "roughing." Sensitivity for accuracy and fine surface finishing. Exclusive solid ram for stamina, low maintenance and easier adjustment. Standard and heavy duty models for modern tool room and production service.



SIZES
16″
20″
24″
25″
28″
32″
36″

PLAIN TABLES • TILTING TABLES
UNIVERSAL TABLES

The Smith & Mills COMPANY
affiliated with Bryant Machinery & Engineering Company
General Office: 640 W. Washington Blvd., Chicago 6
EXCLUSIVE REPRESENTATIVES THROUGHOUT THE WORLD

Fine Shapers since 1888

NOW 4 TYPES 295 SIZES Starrett® precision ground FLAT STOCK AND DIE STOCK

NO. 497 AIR HARDENING
NO. 496 OIL HARDENING
NO. 495 OIL OR WATER HARDENING
NO. 495 WATER HARDENING



Save time. Save money. Save valuable man and machine hours. Use Starrett precision ground Die and Flat stock for all precision parts, pieces, punches, dies and special tools having two flat, parallel sides. Just select the right type and size of flat stock from the complete Starrett line . . . lay it out . . . and saw it out. (For best cutting, use Starrett Band Saws.)

Keep a supply of frequently used sizes in the tool crib . . . or call your Industrial Distributor for prompt, dependable, quality service.

LOOK FOR THE MARK OF PRECISION

Starrett®

ON EVERY PIECE

Each piece is marked for type and size and individually packaged in a protective envelope showing chemical analysis, hardening and tempering information.

WRITE FOR NEW FOLDER AND WALL CHART

listing the 295 sizes available and giving hardening formulas for the four types. Address Dept. D.



STARRETT TOOLS

TRADE MARK **Starrett** REG U S PAT OFF

SINCE 1880
WORLD'S GREATEST TOOLMAKERS



THE L. S. STARRETT COMPANY
Athol, Massachusetts, U. S. A.

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR

Prompt delivery
Dependable service
Quality products

For more information on products advertised, use Inquiry Card, page 247

MACHINERY'S DATA SHEETS 745 and 746

MACHINERY'S DATA SHEET INDEX — 1
February, 1951, to December, 1953, Inclusive

Aluminum Alloys, Recommended Practice for Drilling, Apr. '51, May '51 ..... 679 to 682
Aluminum, Electrolytic Oxide Treatments for, Sept. '51 689
Aluminum Sheet and Plate, Minimum Bend Radii for 90- and 180-Degree Bends, July '51 .. 686
Aluminum, Typical Chemical Finishes for, Nov. '53 ..... 741, 742
Aluminum, Typical Cleaning Practices for, Feb. '51 ..... 675, 676
Aluminum, Typical Electroplating Processes for, Sept. '51 690

Bearings, Sizes of Sleeve Type Half-Bearings, Sept. '53 .. 737, 738
Bend Radii, Minimum for 90- and 180-Degree Bends in Aluminum Sheet and Plate, July '51 686
Bushings, (Guide-Post) for Punch-Press Die Sets, Dimensions of, Aug., '51 ..... 687, 688
Bushings, Recommended Interference Fits for Cast Iron and Steel, in Aluminum at Room Temperature, July '51 685

Carbide Tips for Single-Point Tools, Shapes and Sizes of Sintered, June '51 ..... 683, 684
Centerless Through-Feed and In-Feed Grinding Troubles and How to Correct Them, Common, Aug. '52, Sept. '52 .. 711 to 714
Cleaning Aluminum, Typical Practices for, Feb. '51 ..... 675, 676
Cutting Speeds and Feeds Recommended for Machining Stainless Steel, Feb. '52 ..... 699, 700

Die Sets, Dimensions of, Nov. '51 693
Die Sets, Dimensions of Back-Post Punch Press, Oct. '51 ..... 691, 692
Die Sets, Dimensions of Guide-Post Bushings for Punch Press, Aug. '51 ..... 687, 688
Die-Set Guide Posts and Punch-Holder Shanks, Dimensions of, Nov. '51 694
Drilling Aluminum Alloys, Recommended Practice for, April '51 May '51 ..... 679 to 682
Drilling, Useful Information for, April '53, May '53 .... 727 to 730

Electroplating Processes for Aluminum, Typical, Sept. '51 690
Engine and Tool-Room Lathes, Standards for Accuracy of, Oct. '52, Nov. '52, Dec. '52 .. 715 to 719

Feeds and Cutting Speeds for Machining Stainless Steels, Recommended, Feb. '52 ..... 699, 700
Finishes for Aluminum, Typical Chemical, Nov. '53 ..... 741, 742
Fits for Cast-Iron and Steel Bushings in Aluminum at Room Temperature, Recommended Interference, July '51 685

Grinding Troubles and How to Correct Them, Common Centerless Through-Feed and In-Feed, Aug. '52, Sept. '52 .... 711 to 714
Guide Posts and Punch-Holder Shanks, Dimensions of Die-Set, Nov. '51 694

Half-Bearings, Sizes of Sleeve Type, Sept. '53 ..... 737, 738

Inconel Sheet, Recommended Conditions for Spot-Welding Annealed, April '52 ..... 703, 704

Keyseats for Sheaves and Shafts of Multiple V-Belt Drives, Dimensions of, June '52 708

Lathes, Standards for Accuracy of Engine and Tool-Room, Oct. '52, Nov. '52, Dec. '52 .. 715 to 719
Lock Washers, Standard Internal and External Tooth, Feb. '53 ..... 723, 724
Lock-Washer and Machine-Screw Assemblies, Standard Spring and Standard Tooth, Mar. '53 ..... 725, 726

MACHINERY'S Data Sheet No. 745, January, 1954

MACHINERY'S DATA SHEET INDEX — 2
February, 1951, to December, 1953, Inclusive

Lock Washers, Dimensions of Internal-External Tooth, Jan. '53 ..... 721, 722

Machine Screw and Lock-Washer Assemblies, Standard Spring and Standard Tooth 725, 726
Masonry Drills, Recommended Practice for Sharpening Carbide-Tipped, Dec. '53 743
Milling Cutter for Stainless Steel, Design of High-Speed Steel, Mar. '52 701
Monel Sheet, Recommended Conditions for Seam Welding, Dec. '53 744
Monel Sheet, Recommended Conditions for Spot-Welding Annealed, Jan. '52 ..... 697, 698

Nickel and High-Nickel Alloys, Pickling Recommendations for, Prior to Welding, Mar. '52 702
Nickel Sheet, Recommended Conditions for Spot-Welding Annealed, Dec. '51 ..... 695, 696

Oxide Treatments, Electrolytic for Aluminum, Sept. '51 689

Pickling Recommendations for Nickel and High-Nickel Alloys Prior to Welding, Mar. '52 702
Punch-Holder Shanks and Die-Set Guide Posts, Dimensions of, Nov. '51 694

Sawing Problems, Suggested Corrective Measures for Various, Oct. '53 ..... 739, 740
Sharpening Carbide-Tipped Masonry Drills, Recommended Practice for, Dec. '53 743
Sheaves, Multiple V-Belt, Dimensions of, June '52 707
Sintered-Carbide Tips for Single-Point Tools, Shapes and Sizes of, June '51 ..... 683, 684
Spot-Welding Annealed Inconel Sheet, Recommended Conditions for, April '52 ..... 703, 704
Spot-Welding Annealed Monel Sheet, Recommended Conditions for, Jan. '52 ..... 697, 698
Spot-Welding Annealed Nickel Sheet, Recommended Conditions for, Dec. '51 ..... 695, 696
Spot-Welding Dissimilar Metals, Recommended Conditions for, Dec. '52 720
Spring Steel, Weight of Blue-Tempered, per Lineal Foot, June '53, July '53 .... 731 to 734
Stainless Steel, High-Speed Milling Cutter Design for Milling, Mar. '52 701
Stainless Steels, Recommended Cutting Speeds and Feeds for Machining, Feb. '52 ..... 699, 700

Tool-Room and Engine Lathes, American Standard for Accuracy of, Oct. '52, Nov. '52, Dec. '52 ..... 715 to 719
Tools, Shapes and Sizes of Sintered-Carbide Tips for Single-Point, June '51 ..... 683, 684
Tubing, Standards for Single-Wall and Double-Wall Steel, Aug. '53 ..... 735, 736

V-Belt Drives, Design of Quarter-Turn Multiple, July '52 .. 709, 710
V-Belt Drives, Dimensions of Sheave and Shaft Keyseats for Multiple, June '52 708
V-Belt Drives, Dimensions of Standard Sheaves for Multiple, June '52 707
V-Belts, Cross-Sections and Pitch Lengths of Standard, May '52 ..... 705, 706

Washers, Standards for Plain, Mar. '51 ..... 677, 678
Weight of Blue-Tempered Spring Steel, per Lineal Foot, June '53, July '53 ..... 731, 734
Welding Monel Sheet, Recommended Conditions for Seam, Dec. '53 744
Welding, Pickling Recommendations for Nickel and High-Nickel Alloys Prior to, Mar. '52 702

MACHINERY'S Data Sheet No. 746, January, 1954

822

PIECES PER HOUR

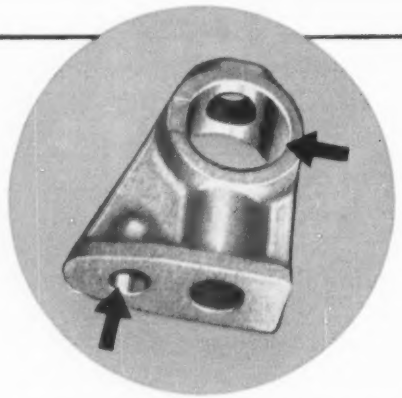
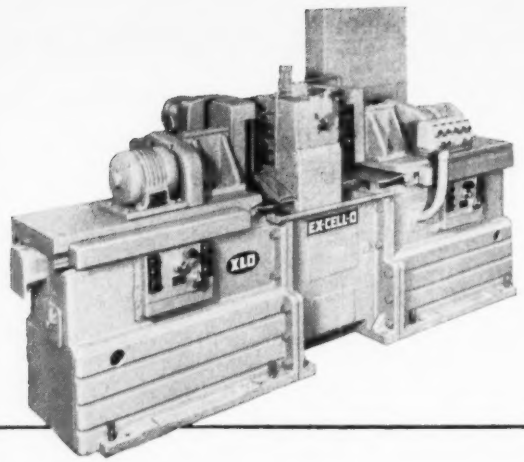


Photo above shows one of the die-cast aluminum workpieces. Arrows point to the bored holes which are held to plus or minus .0005". Four parts are machined during each cycle, netting 822 pieces per hour.



FROM THIS

EX-CELL-O

3-Way Machine

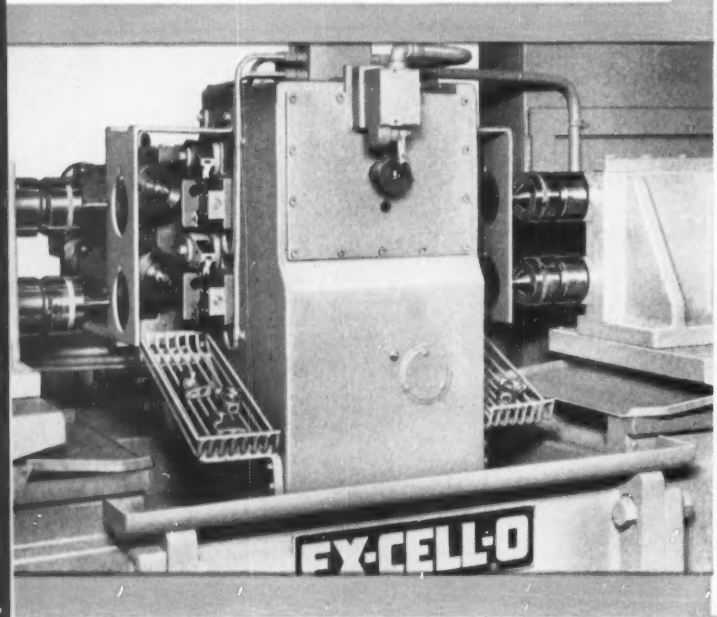
Works From 3 Directions Simultaneously

This Ex-Cell-O three-Way Precision Boring Machine consists of three standard, self-contained way units joined to a center section. The left and right way units have two spindles each, mounted one above the other on angle plate brackets. The rear unit carries four spindles, two on each side. The center section supports a fixture accommodating two parts on each side. Work is clamped and ejected hydraulically.

Ask your local Ex-Cell-O representative about all the other advantages of Ex-Cell-O Way Machines, or write today for Bulletin 31631.

XLO

EX-CELL-O for PRECISION



Two parts are held in each side of the fixture. Left and right slides bore 13/16" diameter hole through each part, while rear slide is boring 5/16" blind holes at right angles to the others. The work is unclamped and ejected automatically at the end of the machining cycle.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS
RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT
AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

also retain his position as treasurer. Other officers are WALT GUNNERSON, vice-president in charge of sales; V. J. SPENCER, vice-president; and GEORGE BOONE, secretary.

BEARDSLEY AND PIPER DIVISION OF PETTIBONE MULLIKEN CORPORATION, Chicago, Ill., has placed on the market a new line of automatic and semi-automatic shell molding machinery, developed in cooperation with the WINTER ENGINEERING CO., Buffalo, N. Y. OTTO W. WINTER, president of the Buffalo company and a past national president of the American Society of Tool Engineers, will head Beardsley & Piper's new Shell Mold Division.

BARBER-COLMAN CO., Rockford, Ill., announcs the appointment of ROBERT A. HORNER as divisional manager of the Machine and Small Tool Divisions. LEO W. REULAND has been promoted to sales manager of these divisions, succeeding Mr. Horner. FRED B. JENSEN replaces Mr. Reuland as production manager of the Small Tool Division.

ROBERT K. BECK, vice-president and general manager of the Apex Smelting Co., Chicago, Ill., was recently elected president, succeeding W. A. SINGER, who is now chairman of the board.

BRUST TOOL MFG. CO. has opened a new plant in Franklin Park, Ill., to provide expanded facilities for the design and development of production tools.

NOX-RUST CHEMICAL CORPORATION has moved to new quarters at 333 N. Michigan Ave., Chicago 1, Ill.

MAGNESIUM CO. OF AMERICA, East Chicago, Ind., has named GEORGE O. BOHRER chief engineer. Mr. Bohrer succeeds the late V. J. Daniels. C. RIDGELY KEMP, vice-president in charge of production, was appointed to the newly created position of vice-president in charge of research and development. WILLIAM R. DAVISON succeeds Mr. Kemp as vice-president in charge of production.

WILLIAM FEW has been appointed chief engineer of Penn Controls, Inc., Goshen, Ind. In his new job, Mr. Few will be responsible for the company's expanded research and product development program.

Michigan

SCULLY-JONES & CO., Chicago, Ill., has recently named seven Michigan distributors for their precision holding tools: BOBIER TOOL CO., 1838 S. Dort Highway, Flint; INDUSTRIAL EQUIPMENT & SUPPLY CO., 211 W. Main St., Benton Harbor; GRAND RAPIDS SUPPLY CO., Grandville and Wealthy, S. W., Grand Rapids; KENDALL HARDWARE-MILL SUPPLY, INC., 1918 King Highway, Kalamazoo; STURM TOOL SUPPLY CO., 705 E. Main St., Lansing; LAKESHORE MACHINERY & SUPPLY CO., 400 W. Laketon Ave., Muskegon; and MAHAR TOOL SUPPLY CO., 1708 Michigan Ave., Saginaw.

EDGAR D. LEON, has been elected president and a director of the Gear Grinding Machine Co., Detroit, Mich. Mr. Leon comes to the company from the Hickory Pattern & Foundry Co., Detroit, Mich., which he owned and operated for the last three years. He will assume the management of the company's three divisions: Rzeppa universal joints, grinding services, and Geargrind machines.

CLEVELAND CRANE & ENGINEERING CO., Wickliffe, Ohio, has opened an office at 2361 Penobscot Bldg., Detroit, Mich., for the sale and service of Steelweld metal-forming presses and shears in Michigan. RALPH K. FORD, who has been associated with the Steelweld Machinery Division for several years, will be head of the office.

JACK L. MUSTARD has been named assistant general sales manager of the Industrial Division Ex-Cell-O Corporation, Detroit, Mich. Mr. Mustard has been with Ex-Cell-O since 1930. Recently, he was assistant sales manager of the company's Precision Products Division.

R & B TOOL CO., Saline, Mich., has purchased 13,000 square feet of land adjoining its plant site as part of an expansion program. The company designs and builds multiple-spindle drilling and tapping equipment.

WESSON METAL CORPORATION, Lexington, Ky., carbide producer has opened an office at 18353 W. McNichols, Detroit, Mich. RAY GORMAN, general sales manager, is in charge. The new office will serve as the principal "Wessonmetal" outlet for fabricators throughout Michigan.

CURTIS I. KAHLER, was recently appointed honing equipment sales engineer by the Barnes Drill Co., Rockford, Ill., with offices at 6560 Epworth Blvd., Detroit, Mich. Mr. Kahler will cover the midwestern and eastern territories.

THEODORE P. WITKOWSKI has joined the Carboloy Department of General Electric Co., Detroit, Mich., as an engineer in the metallurgical process and quality control unit for permanent magnet materials. He will be in the Edmore, Mich., plant.

GENERAL ELECTRIC CO., Schenectady, N. Y., announces plans to build a multi-million dollar plant at Holland, Mich., which will be the headquarters for its Hermetic Motor Department.

MATTHEW J. BETLEY has been appointed vice-president and general manager of Aeroquip Corporation, Jackson, Mich., manufacturer of flexible hose lines and hydraulic fittings.

New York

WALDES KOHINOOR, INC., of Long Island City, N. Y., manufacturer of Waldes "Truarc" retaining rings, grooving tools, and other products, has appointed JOHN A. PETRIE factory representative of its Truarc Division in Ohio, West Virginia, east Kentucky, and western Pennsylvania. He will make his headquarters at 716 S. Chesterfield Road, Columbus, Ohio. JOHN C. PARRY becomes assistant to the Truarc sales manager in Mr. Petrie's stead. PRECISION BEARING & TRANSMISSION CO., 2851 Farnham St., Omaha, Neb., has been made a distributor for the Truarc line throughout Nebraska. BEARING DISTRIBUTORS, Troy, N. Y., another Truarc distributor, has opened a branch office at 327 Fenn St., Pittsfield, Mass., headed by LEWIS K. SNEARLY, to serve western Massachusetts and Vermont.

A. MILNE & CO., New York City, tool steel distributors, announce several appointments: HARVEY C. BLESCH, formerly at the Chicago, Ill., office, becomes manager of the St. Louis, Mo., office; JOHN I. KITTS, Dayton, Ohio, manager, replaces H. D. GROTH as manager of the Cleveland, Ohio, office, Mr. Groth having resigned; CARL F. RAND, who was manager at Worcester, Mass., becomes manager at Dayton; and FRANK R. SANNING advances to the post of manager of the Worcester office.

A. L. FOSCUE has been appointed president of the Electro Metallurgical Co., and United States Vanadium Co., Divisions of Union Carbide and Carbon Corporation, New York City. Mr. Foscue succeeds WALTER E. REMMERS, who becomes chairman of both companies. Mr. Foscue has been with Union Carbide in various assignments since 1924. In 1949, he became works manager of the Electro Metallurgical Co., and a vice-president of this company in 1951.

LAKE ERIE ENGINEERING CORPORATION, Buffalo, N. Y., now has available a service by which customers can purchase packaged installations. Lake Erie surveys the hydraulic press or die-casting requirements, then designs, manufactures, supplies, and installs all the basic machinery, tools and dies, conveyors, loading mechanisms, furnaces and other related equipment. A field force follows through, training supervisory and production personnel.

BOROLITE CORPORATION, Niagara Falls, N. Y., has been formed by three companies to jointly engage in

research and development of various metal borides for high-temperature applications. The companies are FIRTH STERLING, INC., Pittsburgh, Pa.; AMERICAN ELECTRO METAL CORPORATION, Yonkers, N. Y.; and THE CARBORUNDUM COMPANY, Niagara Falls, N .Y.

WAYNE G. NORTON has become general sales manager of Optical Gaging Products, Inc., Rochester, N. Y., while JOHN A. BERNARDINI was made assistant sales manager. This company is the United States and Canadian distributor of the Kodak Contour Projector. Mr. Norton, prior to this appointment, was in the sales department of the Eastman Kodak Co.

BILL L. GAINES has been appointed sales engineer for the South Central division of the Wales-Strippit Corporation, North Tonawanda, N. Y., manufacturer of machine tools. Mr. Gaines will have his headquarters at the St. Louis, Mo., office, handling most of Indiana, Illinois, Missouri, and Kansas.

OAKITE PRODUCTS, INC., New York City, manufacturer of industrial cleaning materials, has designated three new technical service representatives: LINDEN C. WATKINS, for Long Island, N. Y.; R. J. KRAJICEK, for Montana; and JOSEPH M. NEWEY, for Salt Lake City, Utah.

CHARLES HARDY, INC., New York City, producer of metal powders, has established an international sales department with E. L. HOEFLICH as manager. The department will specialize in distributing a select group of machinery and industrial equipment lines.

JOHN F. LAMPE, formerly sales manager of the M.B.I. Export & Import Co., has joined the Machine Tool Division of Kurt Orban Co., Inc., New York City. Mr. Lampe will represent the company in the eastern Pennsylvania and southern New Jersey territory.

Ohio

RELIANCE ELECTRIC & ENGINEERING CO., Cleveland, Ohio, manufacturer of motors, motor drives, and controls, announces the following promotions: JOHN DROLLINGER, JR., manager of the Toledo, Ohio, office, becomes manager of the renewal parts and repair division in Cleveland; WILLIAM C. MITCHELL, a sales application engineer in Baltimore, Md., succeeds Mr. Drollinger in Toledo; and ROBERT O. GEE, an application engineer in the Cleveland applied engineering department, becomes manager of service.

HERMAN D. KRIEGER recently purchased the TERRY SALES CORPORATION, Maumee, Ohio, sales and service representative for Carboloy permanent magnets. L. S. FARRY was named manager. The Maumee concern offers a customer grinding and magnetizing service, and also plans to market horseshoe magnets.

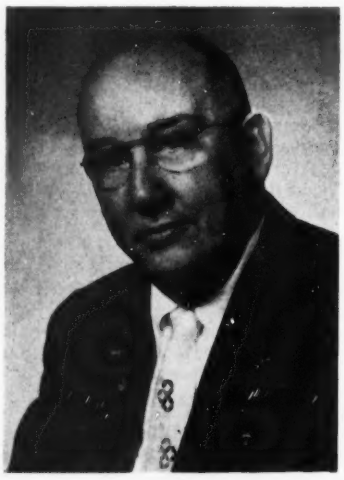
MAXWELL D. MILLARD has been named assistant general manager of sales for the American Steel and Wire Division, Cleveland, Ohio, of the United States Steel Corporation. Mr. Millard started his career with American Steel & Wire in 1934 as a technical apprentice in a wire rope mill in New Haven, Conn.

M. E. DORMAN has been appointed manager of materials for the Canton, Ohio, Division of the E. W. Bliss Co. Mr. Dorman will supervise the purchasing department and also be in charge of inventories, stores, and receiving operations.

HORTON CHUCK DIVISION OF THE E. HORTON & SON CO., Windsor Locks, Conn., announces that its representative, DONALD B. HUNTTING Co., Cincinnati, Ohio, has opened an office at 1904 Brown St., Dayton, Ohio. LEE WEBER will be in charge.

GEOMETRIC STAMPING CO., Cleveland, Ohio, recently elected DAVE R. JONES, chairman of the board of directors, president; and E. F. CARNEY, vice-president and general manager. Mr. Jones had previously served as president from 1915 to 1950.

RALPH H. BEHREND has joined the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, and will be manager of C-frame press sales. Previously, he was superintendent of the tooling division at the Denison Engineering Co., Columbus, Ohio.



Ralph H. Behrend, who is joining the Hydraulic Press Mfg. Co., in a managerial capacity



A. J. Snyder, sales manager of the Cutting Tool Sales Division, Motch & Merryweather Machinery Co.

A. J. SNYDER was recently named sales manager of the Cutting Tool Sales Division of the Motch & Merryweather Machinery Co., Cleveland, Ohio. Mr. Snyder was formerly vice-president and general manager of the Morse Twist Drill Co., New Bedford, Mass. He recently served the Government in the capacity of Chief of the Cutting Tool Section, Metal-Working Equipment Division of the National Production Authority. The Cutting Tool Sales Division, under Mr. Snyder's direction, represents manufacturers of cutting tools and also sells the cutting tools manufactured by the Motch & Merryweather Machinery Co. in its Euclid plant.

METAL CARBIDES CORPORATION, Youngstown, Ohio, has opened an addition to its main plant on a 25-acre site at 6001 Southern Blvd. in that city. The facility is to be used to produce tool tips, die nibs, bar stock, rings, bushings, and special shapes of tungsten carbide.

CHARLES E. SCHMITT, former machine and tool buyer of the Cleveland Cadillac Tank Plant, has been named Ohio sales engineer of the Ace-Central States Machine Tool Company, Detroit, Mich. Mr. Schmitt has his offices in the Carnegie Hall Bldg., Cleveland, Ohio.

JOHN E. MARSH is joining the Herr Equipment Corporation, Warren, Ohio, as a sales engineer. Mr. Marsh has fifteen years' experience in designing and developing strip mill auxiliary equipment.

JOSEPH POMMERSHEIM has been promoted to the post of chief engineer at the Norwalk, Ohio, plant of the Rockwell Mfg. Co., Pittsburgh, Pa.



"Crown" automatic electric percolator, made by Robeson-Rochester Corp., Rochester 1, N.Y.

FOR DEEP DRAWING METALS

Consult Revere



Some four years ago the Robeson-Rochester Corporation told us that it was dissatisfied with the quality of the copper and brass it was receiving. Could we look into it, even though it was not our metal? Revere was glad to do so. Technical Advisors studied production methods in detail, and made specific recommendations regarding temper, which they reported was the key to the matter. A trial order was placed with Revere for copper circles in the suggested temper. These drew satisfactorily, without requiring intermediate anneals, and resulted in the establishment of a lasting business association. . . . If your production methods include deep drawing, perhaps Revere's knowledge can be used to advantage. See the nearest Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N.Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

CHARLES R. YOUMANS has joined the Cyril Bath Co., Solon, Ohio, and will be on the sales staff.

Pennsylvania

H. K. PORTER CO., INC., Pittsburgh, Pa., recently acquired the ALLOY METAL WIRE CO., Prospect Park, Pa., producer of stainless and alloy steel wire, rod, and strip. The Alloy Metal Wire Co. will continue as a division. Another division of H. K. Porter, Inc., the Watson-Stillman Fittings Division at Roselle, N. J., is undertaking a $250,000 plant expansion. When completed, the facilities will enable the company to increase its production of forged steel fittings and also provide better customer service.

BALDWIN-LIMA-HAMILTON CORPORATION, Philadelphia, Pa., announces the appointment of JOHN J. LITTLEY as assistant sales manager of its hydraulic press and power tool department. Mr. Littley joined the concern in 1946 as a design engineer and was later transferred to the sales department. For the last four years he has been stationed in the Chicago office. FRED E. GREGER has been named sales manager of the STANDARD STEEL WORKS DIVISION of the corporation, Burnham, Pa.

J. P. GILL, was recently elected president of the Vanadium-Alloys Steel Co., Latrobe, Pa. Mr. Gill joined the company in 1920 as chief metallurgist, and in 1943 was elected vice-president. Two years later he was made chairman of the executive committee of the Vanadium-Alloys Steel Co. and subsidiaries. Mr. Gill is now president of the Colonial Steel Division of the company, and was recently named president of Vanadium-Alloys Steel Canada Limited.



J. P. Gill, new president of the Vanadium-Alloys Steel Co.

WESTINGHOUSE ELECTRIC CORPORATION, Pittsburgh, Pa., will build a metals development plant at Blairsville, Pa. Scheduled for completion by late 1955, the new plant will be devoted to metallurgical development and pilot production of special alloys and castings. Activities at Blairsville will supplement the specialized metalurgical effort now being carried on at the company's aviation gas turbine, atomic power, and lamp divisions.

ROCKWELL MFG. CO., Pittsburgh, Pa., has purchased the CALLANDER FOUNDRY & MFG. CO., LTD., Guelph, Ontario. The Canadian company produces "Beaver" power tools and a line of electrical conduit fittings. It will be operated as a Rockwell subsidiary. W. W. BRYDGES, Callander president, will be president of the subsidiary, and W. F. ROCKWELL, JR., will be chairman of the board of directors.

L. M. WALKER has been named manager of the industrial apparatus section in the agency and construction department by the Westinghouse Electric Corporation, Pittsburgh, Pa. With offices at the East Pittsburgh plant, he will coordinate headquarters activities with the industrial apparatus activities of sales offices throughout the country. Mr. Walker was formerly in the Birmingham, Ala., office.

B. A. KLINE has been appointed sales manager of the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. He will also serve as advertising manager of the company. Before his appointment, Mr. Kline was assistant to the vice-president.

F. P. MAXWELL is joining the Power Tool Division of the Rockwell Mfg. Co., Pittsburgh, Pa., assuming the newly created position of vice-president. Mr. Maxwell has resigned as president of the Acro Mfg. Co., Columbus, Ohio, but he will continue to serve on the Acro board of directors.

JOHN SCHLARB and VERN WILSON have been made works manager and general foreman, respectively, of the Pennsylvania Peerless Corporation, Pottsville, Pa. Both men come to the new company from the Peerless Production Co., Detroit, Mich.

KENNETH L. WALKER, formerly superintendent of the boiler shop of the Carteret, N. J., plant of Foster Wheeler Corporation, New York City, has been appointed superintendent of the company's new plant at Mountaintop, Pa.

EMJAY MAINTENANCE ENGINEERS, Rutherford, N. J., have opened a branch office at 401 N. Broad St., Philadelphia, Pa. CHARLES A. CONNELL, vice-president of the concern, will be in charge there.



Carl Hammon, who is joining the engineering staff of the Erie Foundry Co.

CARL HAMMON has joined the engineering staff of the Hydraulic Press Division, Erie Foundry Co., Erie, Pa. Mr. Hammon was formerly associated with the Watson-Stillman Co. for a period of eighteen years.

BUDD CO., Philadelphia, Pa., will market aluminum forged disc truck wheels for the first time through its distributors. The wheels are forged at the Cleveland Works of the Aluminum Company of America.

GILBERT P. MUIR ASSOCIATES, 26 Robin Hood Drive, Pittsburgh, Pa., has been made western Pennsylvania sales representative for the ALLOY PRECISION CASTINGS CO., Cleveland, Ohio.

Dr. JOHN C. HAMAKER, JR., has joined the Vanadium-Alloys Steel Co., Latrobe, Pa., and will be in the metallurgical research department.

West Virginia, Florida and Alabama

G. C. WILSON & CO., designers and manufacturers of electronic timers, have moved from Chatham, N. J., to Huntington, W. Va., where they will have increased facilities for production and service.

R. O. HULL & CO., INC., Rocky River, Ohio, has established the ROHCO CORPORATION at 4220 E. Eleventh Ave., Hialeah, Fla., to distribute the electroplating specialties of the company. C. J. WHITWORTH will supervise the new service.

FIRTH STERLING, INC., Pittsburgh, Pa., announces the removal of its southern district office to 2201 Highland Ave., Birmingham, Ala. Formerly, it was located at 2308 Fourth Ave., N., in that city.



By the use of high electrical voltage Metalmaster has given its user the power and speed to cut the hardest metals man has been able to produce . . . This we call DISINTEGRATION for it actually disintegrates the metal without affecting the hardness.

Metalmaster Disintegrators save thousands of dollars each month for their users through the salvage of workpieces normally going into scrap.

One firm alone through the use of two Metalmasters saves annually over $70,000.00 in just tool and die repair alone.

IMAGINE, for a moment, the potential . . . if you could cut ANY shape hole, ANY size in ANY hardened metal!

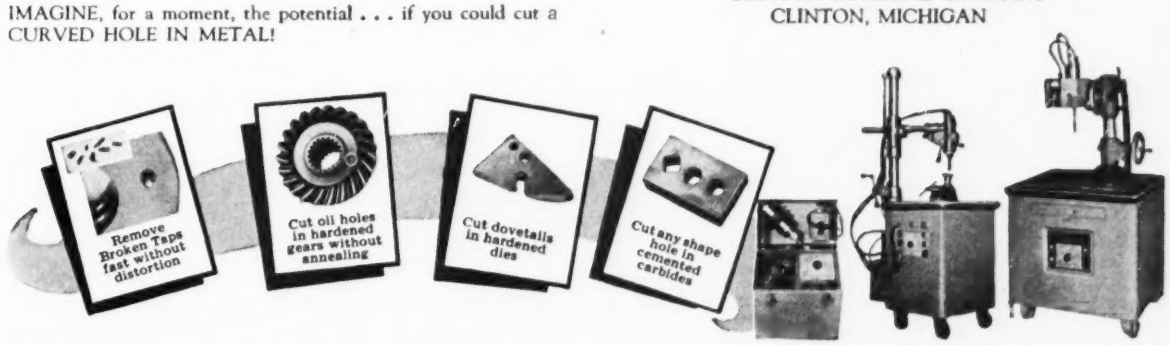
IMAGINE, for a moment, the potential . . . if you could cut a CURVED HOLE IN METAL!

IMAGINE, for a moment, the potential . . . if you could save that enormous scrap pile of workpieces with broken taps, drills, reamers, etc. You can do it with Metalmaster . . . in a matter of minutes per part.

IMAGINE, for a moment, the potential . . . of a machine that in many cases saves its initial cost in just one free demonstration in a customer's plant. This is a common occurrence with Metalmaster.

For information relative to the many machines available for your type operation and the many advantages Metalmaster can offer your firm, write today on your company letterhead to:

METALMASTER DIVISION:
CLINTON MACHINE COMPANY
CLINTON, MICHIGAN



Wisconsin, Missouri, and Minnesota

AMPCO METAL, INC., Milwaukee, Wis., has appointed the following distributors: PRODUCTION MATERIALS CO., 2641 University Ave., St. Paul, Minn.; GUILFORD WELDING SUPPLY CO., 1600 Guilford Ave., Baltimore, Md.; GENERAL DISTRIBUTING CO., INC., Great Falls, Mont,; ALLAN P. JAMES CO., 430 Ninth St., San Francisco, Calif.; PERSINGERS, INC., 520 Elizabeth St., Charleston, W. Va.; ZANE WELDCRAFT SUPPLIES, 171 Wethersfield Ave., Hartford, Conn.; and KIRK-WIKLUND & CO., 1700 Baltimore St., Kansas City, Mo.

MELVIN B. MONSON, manager of the work order department of Joseph T. Ryerson & Son, Inc., Chicago, Ill., has been made assistant manager at the Milwaukee, Wis., steel service plant. This plant, located at 500 S. 88th St., was recently opened, and is four times larger than the old plant at 320 S. 19th St. JOHN W. BODWELL is assuming the post vacated by Mr. Monson.

WALLACE R. PERSONS has been elected president and a director of the Emerson Electric Mfg. Co., St. Louis, Mo., succeeding W. S. SNEAD who will remain as chairman of the board of directors. Mr. Persons was vice-president and general sales manager at the Lincoln Electric Co., Cleveland, Ohio, for the last seven years.

FRANK F. MULKEY has been named manager of the St. Louis, Mo., office of the Falk Corporation, Milwaukee, Wis., manufacturer of power transmission equipment. Mr. Mulkey has been associated with Falk since 1941.

HAROLD W. SWEATT, president of the Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., since 1934, was recently elected chairman of the board, succeeding MARK C. HONEYWELL, who was named honorary chairman. PAUL B. WISHART, who was vice-president and general manager of the company, succeeds Mr. Sweatt as president.

Coming Events

JANUARY 25-28—PLANT MAINTENANCE AND ENGINEERING SHOW to be held at the International Amphitheatre, Chicago, Ill. For further information write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N .Y.

APRIL 26-30—Tenth Biennial Industrial Exposition of the AMERICAN SOCIETY OF TOOL ENGINEERS to be held at Convention Center in Philadelphia, Pa. Executive secretary, Harry E. Conrad, 10700 Puritan Ave., Detroit 21, Mich.

MAY 4-7—National spring technical meeting of the AMERICAN WELDING SOCIETY to be held at the Hotel Statler, Buffalo, N. Y. in conjunction with the Second Welding and Allied Industry Exposition at the Buffalo Memorial Auditorium. National secretary, J. G. Magrath, 33 W. 39th St., New York 18, N. Y.

MAY 17-20—SECOND BASIC MATERIALS EXPOSITION AND CONFERENCE to be held at the International Amphitheatre, Chicago, Ill. For further information, write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

JUNE 7-10—Sixth National Plastics Exposition sponsored by the SOCIETY OF THE PLASTICS INDUSTRY, INC., at the Public Auditorium in Cleveland, Ohio. Chairman, P. H. Grunnagle, Society of the Plastics Industry, Inc., 67 W. 44th St., New York 18, N. Y.

* * *

Rapid Control of Tension in Steel Strip

A new Westinghouse tensiometer regulator that has a total movement of only 100 mils—less than 1/8 inch—controls tension in steel strip moving 2/3 mile per minute over a range of 20 to 1. Previous regulators had a travel of 2 to 3 inches. The shorter travel permits faster response. Chart records show that the operator of a temper-pass mill can effect a change in strip tension from 8000 pounds down to 6000 pounds in one-half second. Consequently, if the operator sees a bad edge or other defect in the strip, he has a better chance of reducing the tension before a tear occurs.

The tensiometer gets its signal from a reluctance type pick-up, similar in principle to that used in phonograph record players. The signal is amplified by Magamps. A special circuit takes the tensiometer out of operation when tension falls to less than 800 pounds, thus preventing the tensiometer from trying to maintain tension during starting, shutdown, or when the strip breaks. The first use of the new tensiometer was to control the tension between stands of a two-stand temper-pass mill at the Fontana, Calif., mill of the Kaiser Steel Corporation.

* * *

Profits, after taxes, of all corporations in the United States during 1952 were sufficient to cover the cost of federal, state, and local governments for only 71.84 days, according to the Chamber of Commerce of the United States.

Obituaries

Glen H. Matthews

Glen H. Matthews, sales manager of metal-working machinery at the Mattison Machine Works, Rockford, Ill., died on November 14 at his home



Glen H. Matthews

in Rockford at the age of sixty-two years. Mr. Matthews was born in Ironton, Ohio. His association with the Mattison Machine Works extended over a period of twenty-nine years. Initially, he sold Mattison woodworking machines throughout the country and he later became sales manager of the metal-working division.

A. DONNALLY ARMITAGE, chairman of J. H. Williams & Co., Buffalo, N. Y., died on December 2 at his home in Buffalo, at the age of eighty-one years. Mr. Armitage was born in Middleport, Ohio, and at the age of twenty joined the Whitman & Barnes Mfg. Co., Akron, Ohio, as a factory mechanic. He became associated with J. H. Williams & Co. in 1921 as vice-president. He held the presidency for a period of ten years, and in 1952 he became chairman.

* * *

Investment Casting Shown on Three Dimension Film

A three dimension slide film series in color showing precision investment castings being made from frozen mercury patterns, has been announced by the Alloy Precision Castings Co., Cleveland, Ohio. This film will aid engineers and executives in planning products for "Mercasting." There are forty-five slides showing the steps involved.

TO GEAR MANUFACTURERS *Exclusively*

if you have trouble meeting production schedules.

if you have trouble meeting precision tolerance specifications.

YOU should "read-up" on the HAMILTON® line of Small-Gear, Precision Hobbing Machines!

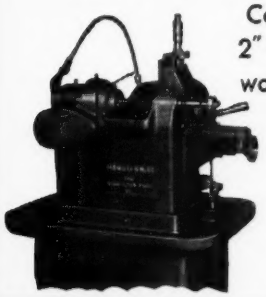
3

THREE *PRECISION* MACHINES to meet your every requirement.

HAMILTON No. 00

For the generation of spur gears and pinions only.

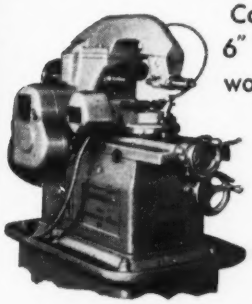
Capacity: 2" O.D. of workpiece.



HAMILTON No. 1

Hobs spur and spiral gears, worm gears and worms (to three thread), splined shafts, gear sectors, and pinions.

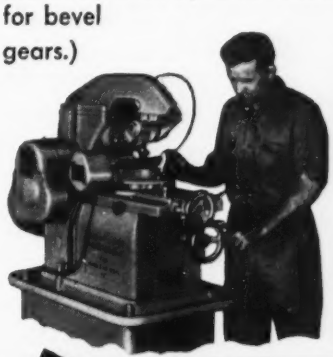
Capacity: 6" O.D. of workpiece.



HAMILTON No. 1-B

Generates any shape that can be made on the No. 00 or the No. 1 machines, *plus* bevel gears and face gears.

Capacity: 6" O.D. of workpiece (3" O.D. by 3/16" face, for bevel gears.)



Exclusive Greater range of hob spindle speeds: 109 to 1259 R.P.M. — 12 speeds.

Exclusive Speed, feed, indexing. *Each can be selected independently.* This, and wide range of hob speeds, adds flexibility; reduces set-up time; gives quick selection of speed and feed to suit material and gear size.

Exclusive Alignment and trueness of work and hob spindles are held to within .0002".

Exclusive Generates gears from 3 teeth to 1200 teeth.

Exclusive Accumulative error of not more than .0002"

THE COMPLETE STORY will be sent to you free for the asking. Request BULLETIN GH-5310 DO IT NOW!

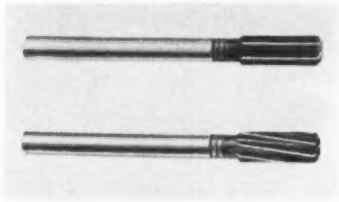
THE *Hamilton* TOOL COMPANY

814 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

(*Continued from page 250*)

Chicago-Latrobe Expands Reamer Size Range

Chicago-Latrobe, Dept. M, 411 W. Ontario St., Chicago 10, Ill., have expanded their line of chucking reamers. Now available as standard fractional sizes in their spiral-flute straight-shank line are 5/64- through 31/64-inch diameter reamers in increments of

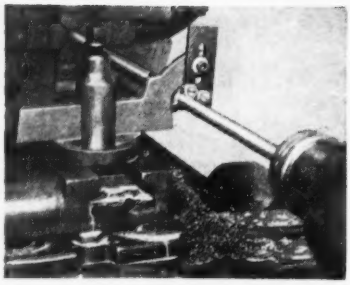


1/64 inch. Straight-flute, straight-shank chucking reamers are obtainable in the same fractional increments from 3/64 to 31/64 inch in diameter; in wire gage size from No. 1 through No. 6; in letter sizes from A through Z; and in decimal sizes from 0.124 to 0.501 inch in diameter.

Self-Contained Pneumatic Die Cushion

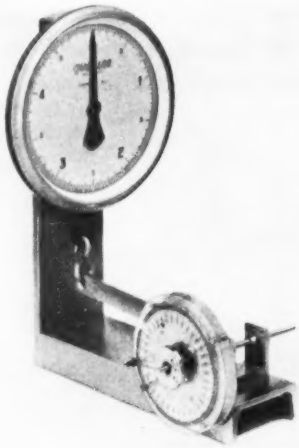
The Dayton Rogers Mfg. Co., Dept. M, Minneapolis 7, Minn., has brought out a Model CR self-contained pneumatic die cushion. This new design is of all-steel construction and is provided with a hardened and ground pressure-pad which is custom made to specific die and punch press requirements. The pneumatic die cushion may be fastened directly to the bolster plate or it can be fastened directly to the die-shoe.





Follow-Rest Tool-Holder

Combination tool holder- and follow-rest designed for rapid turning of long, small-diameter shafts announced by the Pull-Gear Co., Dept. M, 4118 E. 8-Mile Road, Detroit 34, Mich. This tool can be used for turning shafts up to 1 1/2 inches in diameter, and adjusted quickly by dropping the roller plate on the shaft and tightening a single screw. The rollers prevent the shaft from chattering, or climbing over the tool bit.

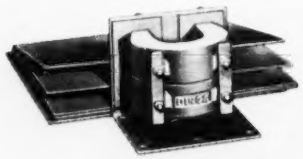


Medium Capacity Torsion Spring Tester

Torsion spring tester of medium capacity, known as Model No. 942, recently placed on the market by John Chatillon & Sons, Dept. M, 85-93 Cliff St., New York 38, N. Y. This tester is designed to test right- and left-hand torsion springs, and is available in capacities from 5 up to 100 inch-pounds. The dynamometer dials are graduated in increments of from 0.02 to 0.5 inch-pounds. The capacity of the tester illustrated is 5 inch-pounds with the dynamometer dial graduated in increments of 0.02 inch-pounds.

Magnetic Sheet Floater

A magnetic sheet floater has been developed by the Dings Magnetic Separator Co., Dept. M, 4740 W. Electric Ave., Milwaukee 46, Wis., for the purpose of separating stacked steel sheets for easier handling. The unit operates on the principle that like magnetic poles repel. Steel sheets placed next to one, or between two, sheet floaters, assume the polarity of the magnet poles, repel one another,



and fan out, as shown in the illustration. The units are available in three basic magnetic strengths and four heights for handling 28 gage through 10 gage blanks in sizes up to 20 by 30 inches.

One-Piece Hose Clamp

One-piece hose clamp manufactured from special spring steel to exacting specifications provides a constant and uniform tightening action. This clamp is known as "The Hoz-Fas-Ner," and is said to insure a perfect seal between the hose and fitting in spite of shrinkage, expansion, or contraction of the hose due to age or temperature changes. The rounded surfaces of the fastener do not cut into hose material, whether rubber, plastic, or fabric. The clamp has a rust-resistant finish. Product of Eaton Mfg. Co., Reliance Division, Dept. M, Charles St., Massillon, Ohio.



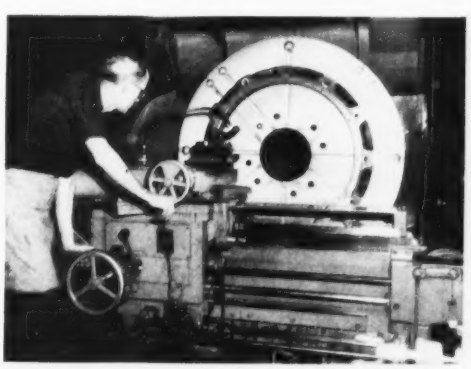
(*This section continued on page* 268)

how high is up?

From the heights of today's costs, profits look . . . and sometimes are . . . mighty small. What to do about it?

Since time and manpower are the vital elements in costs, many progressive manufacturers are using the revolutionary Lodge & Shipley T Lathes* to combat rising costs. The lathe is unequalled for fast, low cost, precision machining of large diameter, thin wall, short length work.

Perhaps you have parts suitable to T Lathe production. Write today for information and Bulletins 215 and 215 Supplement. THE LODGE & SHIPLEY CO., 3055 Colerain Avenue, Cincinnati 25, Ohio.



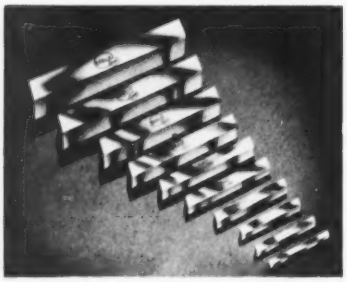
Lodge & Shipley

....your **LODGE**-*ical choice!*

*T. M. The Lodge & Shipley Company

Besly-Welles High-Speed Steel Tool Bits

Ground high-speed steel tool bits recently added to line of cutting tools made by Besly-Welles Corporation, Dept. M, Beloit, Wis. Known as "Bonus Bits," these tools are available as finish-ground bits in ten sizes ranging from 3/16 inch to 1 inch square. They are accurately ground to size to facilitate alignment. The bits are made from a molybdenum-tungsten alloy, and are said to have excellent



red hardness characteristics, resistance to abrasion, and unusual toughness.

Bench Type Lapping Machine

A Rhinevault bench type lapping machine is being distributed by Lopon, Inc., Dept. M, 1649 Sherwin Ave., Chicago 26, Ill. The 150-pound machine can be mounted on any sturdy bench. It operates with a "figure eight" motion at four surface speeds ranging from 250 to 1000 inches per minute powered by a 1/3-H.P. motor. Serrated or smooth 8- by 12-inch cast-iron lap plates are used and are easily interchangeable. Brackets, cast in the base, allow for the addition of special hold-down devices for multiple-piece lapping or for the lapping of angular surfaces. Surface tolerances of less than 12 millionths of an inch are claimed to be obtainable on most materials.



Positive Displacement Coolant Pump

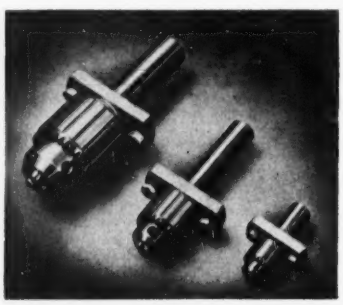
"PresSureKool," a positive pressure pump that combines necessary coolant pressure with grit handling ability, has been placed



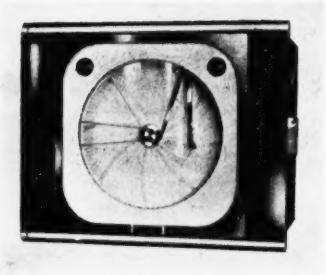
on the market by Associated Engineers, Inc., Dept. M, Box 1628, Springfield, Mass. Among its features is the ability to pump large or small quantities of coolants under pressure to internal grinding wheels and deep boring cutters. The pressure action flushes away abrasive matter and chips.

Barnaby Chuck Type Floating Holder

Alignment of drills, reamers, counterbores and similar tools may be accomplished quickly with Barnaby chuck type floating holders. The holders are made in two parts: the shank, which has an integral flange; and a similar flange on which the chuck is mounted. Two cap-screws, threaded into the shank flange, hold the two parts

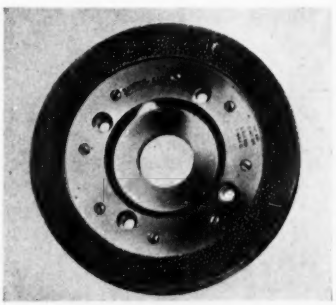


together. Screw holes in the chuck flange are larger than the screws thereby permitting the chuck-held cutting tool to be brought into alignment with the work. These holders are made by the Barnaby Mfg. Co., Dept. M, 74 Knowlton St., Bridgeport, Conn.



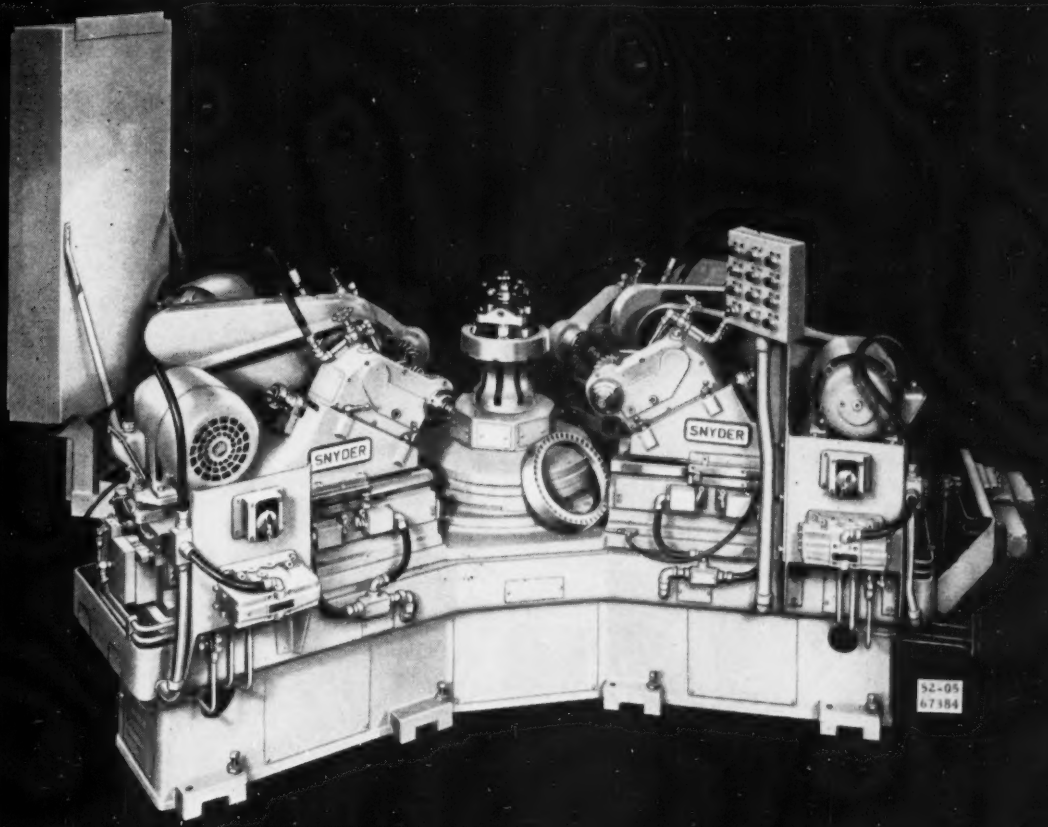
Bristol Time-Temperature Program Controller

Electronic "Dynamaster" recording potentiometer available in the form of a time-temperature program controller from the Bristol Co., Dept. M, Waterbury 20, Conn. This controller regulates temperature according to a predetermined schedule of changing values, accurately controlling any desired program, such as a heating, soaking, and cooling cycle. The desired schedule of temperature is determined by the contour of a transparent plastic cam. The same controller can be used to maintain any number of different temperature programs, since cams of different contours are easily cut and interchanged.



Low-Cost Diamond Wheel

A low-cost diamond wheel has been placed on the market by Super-Cut Distributors, Inc., Dept. M, 3418 N. Knox, Chicago 41, Ill. All the diamonds in the one layer of this wheel are accurately positioned with their protruding points situated in one plane. The wheel is made with a hard nickel bond which, during electroplating, grows laterally as well as vertically, thus tightening its grip on each diamond particle. All nickel is cleared away from the exposed diamond points before the wheel is completed so that its maximum cutting rate is immediately available to the user.



NEW **SNYDER** AUTOMATIC

MILLS **8** SLOTS

IN CAST ALUMINUM ALLOY RING

EVERY **50** SECONDS

AT **80%** EFFICIENCY

SNYDER

TOOL & ENGINEERING COMPANY

3400 E. Lafayette, Detroit 7, Michigan

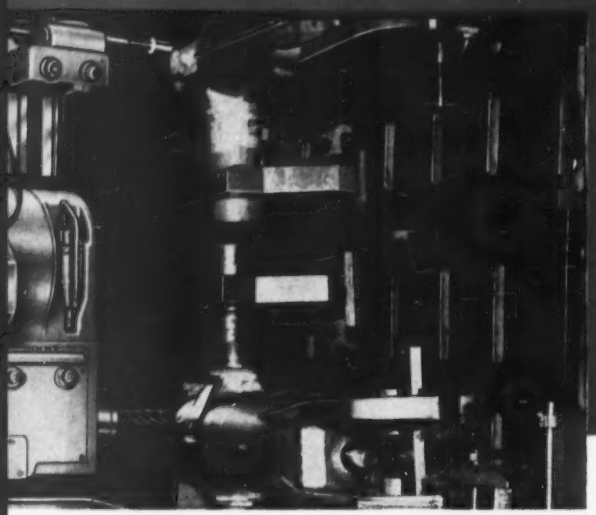
29 Years of Successful Cooperation with Leading American Industries

BEST WAY TO MACHINE COMPLEX, IRREGULAR SHAPES

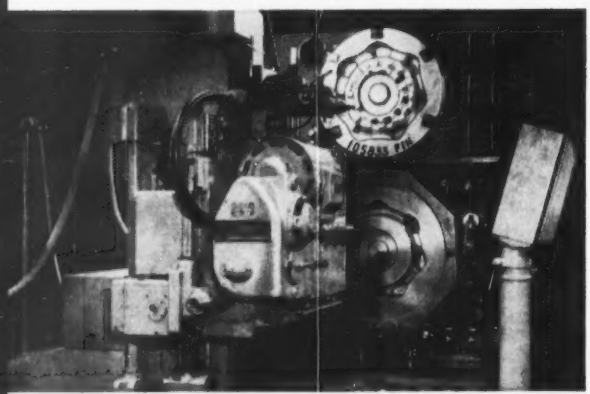
is with a

PRATT & WHITNEY KELLER MACHINE

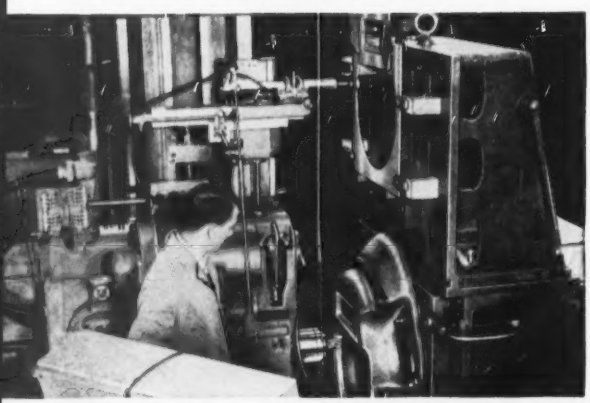
Automatic TRACER CONTROLLED Milling



EXPERIMENTAL AIRCRAFT PART



INTRICATE FORGING DIE



PRODUCTION CONTOUR MILLING

Ideal for FORGING, STAMPING OR DIE - CASTING DIES — PLASTIC, RUBBER OR GLASS MOLDS — METAL PATTERNS — PROTOTYPE OR EXPERIMENTAL PIECES — OR PRODUCTION PARTS

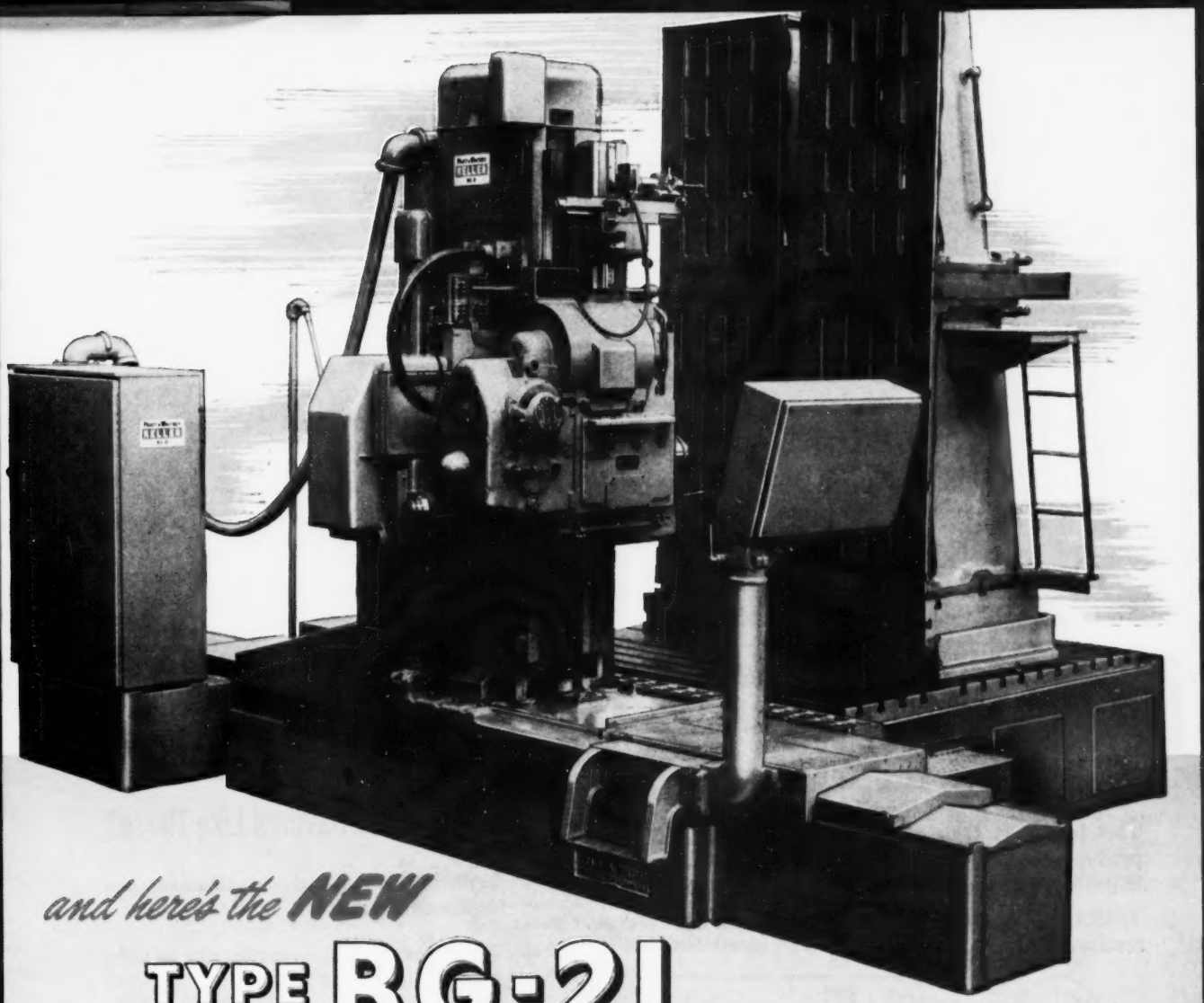
- **MAKES HARD JOBS EASY** . . . handles irregular shapes and complex geometrical curves that cannot be machined conveniently or economically by other methods.

- **DESIGNED AND BUILT SPECIFICALLY FOR TRACER-CONTROLLED MILLING** . . . not just "adapted." Ready to take on an almost unlimited variety of jobs without major adaptation by expensive attachments.

- **RUGGED, DEPENDABLE, STAYS-ON-THE-JOB** . . . year after year without frequent or expensive maintenance.

- **P&W BUILT-IN ELECTRIC TRACER CONTROL** . . . provides instant changeover from two-dimensional (profiling) to three-dimensional operation or vice versa . . . duplicates templates or full models exactly without compensation.

- **P&W HORIZONTAL CONSTRUCTION provides GREATER STRENGTH, RIGIDITY, EFFICIENCY and CONVENIENCE** . . . by moving the machine elements of constant-weight and holding stationary the workpieces of variable-weight, more uniform cutting action is obtained.



and here's the **NEW**

TYPE BG-21

TWO STANDARD SIZES
5 feet x 2½ feet
6 feet x 4 feet

SINGLE AND TWO-SPINDLE MODELS Patterned after the famous giant Keller Type BG-22 but smaller in overall size and capacity, the new Type BG-21 P&W Keller Machine is an entirely new design and incorporates many important new features.

FEATURES

- **CENTRALIZED "PUSH BUTTON" CONTROL . . .** with all machine motions operated by push buttons or switches centralized on a single, conveniently located panel.
- **SIMPLIFIED LUBRICATION . . .** by a one-shot system actuated by a single pump at the operator's station. Insures quick, positive, thorough lubrication of all sliding surfaces.
- **NON-SCORING WAYS . . .** because phenolic-to-metal bearing surfaces are used throughout, (including feed-screw nuts) and telescoping guards are provided to protect the horizontal ways. Operation is smooth, wear is minimized, and original high accuracy is maintained indefinitely.
- **AUTOMATIC CHIP DISPOSAL . . .** screw conveyor type . . . eliminates stopping production to clear away chips.

For Complete Information
Write on your Company letterhead for your free copy of the new BG-21 Circular No. 565.

PRATT & WHITNEY
DIVISION NILES BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U. S. A.



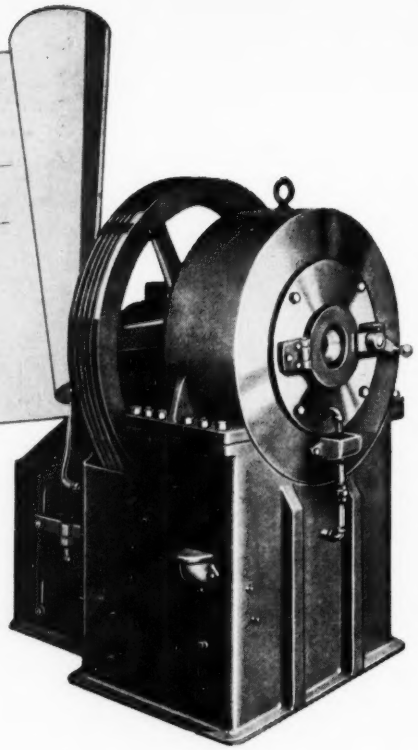
Circular No. 565.

First Choice P&W *for Accuracy*

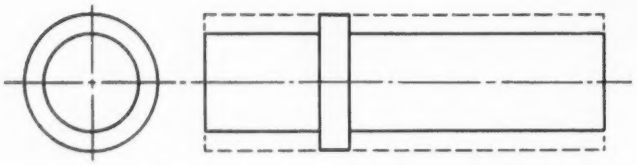
Branch Offices . . . Birmingham • Boston • Chicago • Cincinnati • Cleveland • Dallas (The Stanco Co.) Detroit • Houston (The Stanco Co.) Los Angeles • New York • Philadelphia • Pittsburgh • Rochester • San Francisco • St. Louis • Export Dept., West Hartford

MACHINE TOOLS • CUTTING TOOLS • GAGES

Swaging Success Stories

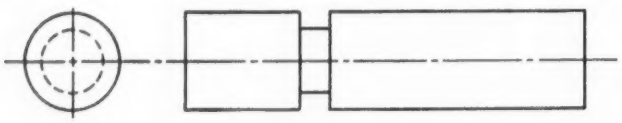


Quicker, Better, Cheaper

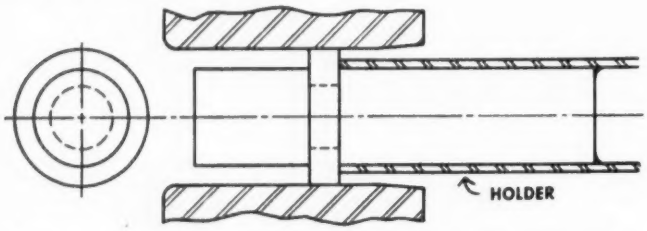


This part was originally turned on a special machine to produce the desired collar or spring seat. The dotted lines indicate wasted, excess material.

Then this manufacturer investigated swaging. Look at the results:



A blank rod with the same diameter as the turned piece was grooved. This provided the location for a ring to be positioned by means of a holder.



Then the ring was swaged firmly into place. Final results—the same as the expensive screw machine piece.

Can You Use Savings Like These?

1. Savings in material—swaging here uses nearly all the metal.

2. Savings in labor—swaging can be done by unskilled hands.

3. Increased output—swaging is fast.

4. Improved products—swaging toughens metal, gives it better resiliency, hardness, finish.

We'll be glad to send you an informative booklet on swaging that contains complete descriptions of Torrington Rotary Swagers. Ask for it today; it may save you money tomorrow.



THE TORRINGTON COMPANY
Swager Department
300 North Street, Torrington, Conn.
Makers of Torrington Needle Bearings

TORRINGTON ROTARY SWAGING MACHINES

For more information on products advertised, use Inquiry Card, page 247

11 MODELS

3 SCREEN SIZES



Pedestal Type
14" Diam. Screen



Bench Type
14" Diam. Screen
4 Models



Bench Type
5¾" x 7¾" Screen
3 Models

Unsurpassed Inspection Versatility

JONES & LAMSON OPTICAL COMPARATORS

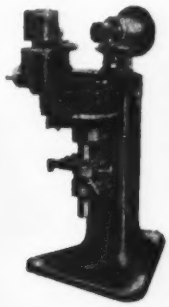
The Essence of Quality Control

Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

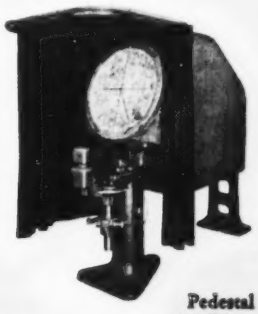
- **They meet** the requirements of toolroom, laboratory and production inspection.
- **They precisely measure** height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
- **They compare** intricately contoured parts with a master outline—and measure the amount of error.
- **They are convenient** to operate, easy to set up and read direct—*without computation.*
- **They operate** under normal lighting conditions. *No darkroom is needed.*
- **They will photograph** the enlarged shadow and record its relationship to a master chart.
- **Several persons** may study the shadow *at the same time.*
- **They will inspect** and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.



Vertical Type
14" Diam. Screen



Direct
Projection
Type



Pedestal Type
30" Diam. Screen

P.S. A complete line of STANDARD CHARTS and FIXTURES is maintained by us.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE COMPANY
512 Clinton St., Springfield, Vt., U.S.A.

J&L COMPARATOR DIV.
Dept. 710



Jones & Lamson Machine Company
512 Clinton Street, Dept. 710
Springfield, Vermont, U. S. A.
Please send Comparator Catalog No. 402.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

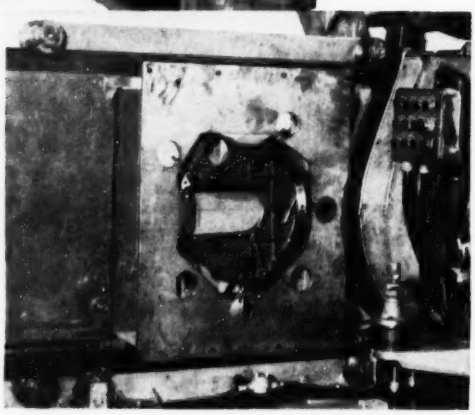
For more information on products advertised, use Inquiry Card, page 247

IT GRINDS TWO SURFACES
For the Price of One!



BESLY

DOUBLE SPINDLE GRINDER



At a production rate of one a minute, this specially designed Model 226-30″ Double Spindle Besly grinds *both sides of torque converter plates at the same time.* With stock removal of .020″, accuracy is .003″ for parallelism and .006″ for size.

This is another example of how Besly grinders are paying off—in this case in higher production for a leading automobile manufacturer. Besly's success in matching the right machine design and the right abrasive to each of many different grinding operations and metals, including the hardest of alloys, is due to over fifty years experience in the grinding field. Our engineers are at your service.

Tailored to Fit the Job . . .

Special jig which holds torque converter plate castings is fed between abrasive discs by long hydraulic piston and cylinder, and oscillated for faster production and greater accuracy. Oscillating movement of jig on slide is controlled by a system of limit switches, timers and solenoid valves. Hydraulic feed of the abrasive discs against the casting is limited by a predetermined stop. Coolant is supplied to the work through the center of the spindles.

BESLY-WELLES
CORPORATION
Established as CHARLES H. BESLY and COMPANY in 1875
112 Dearborn Avenue, Beloit, Wisconsin

BESLY GRINDERS and ACCESSORIES
BESLY TAPS, DRILLS, REAMERS, END MILLS
BESLY-TITAN ABRASIVE WHEELS

For more information on products advertised, use Inquiry Card, page 247



Inspecting a special gage on a Taft-Peirce 24" x 36" Granite Surface Plate.

New Taft-Peirce GRANITE SURFACE PLATE
Keeps Measurements On The Level

FOR PRECISION MEASUREMENTS that require the ultimate in smooth flat surfaces, Taft-Peirce now offers something new in surface plates. A Blue-White Granite Surface Plate. Made of a granite new to toolrooms, it's harder, more wear-resistant, easier to use and care for.

SURFACE ACCURACY is not subject to distortion. Plate is free from all residual stresses. Temperature changes or shock can't warp it.

SMOOTHER, its blue-white grain is extremely fine and even — yet natural pores assure free movement of tools and instruments.

PRACTICALLY INDESTRUCTIBLE, heavy pointed objects dropped on the surface barely powder point of impact. No humps or burrs are raised to impair accuracy. Unique grain direction running 45° to working surface of plate prevents cracking, chipping, or breaking.

RUST-PROOF, no oiling or covers necessary.

LOW POROSITY makes moisture absorption negligible. Tools or work left on this granite surface are not subject to rust.

NON-ABRASIVE, the extra-fine grain won't impregnate readily with dirt or grit particles to cause abrasion. Surface is easily wiped clean and free of foreign matter.

NON-MAGNETIC, it won't deflect instruments. Nor will its soft blue-white color glare or cause disturbing reflections.

ACCURATELY GROUND AND LAPPED, backed by more than 75 years of experience in making precision products, Taft-Peirce Granite Surface Plates are the newest addition to a famous line of layout and inspection equipment.

Write for price list today.

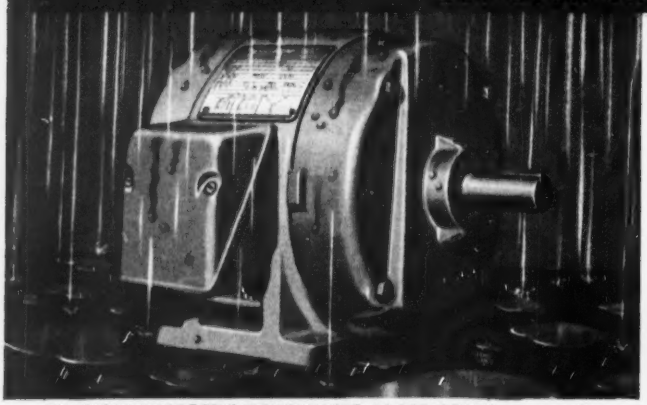
For more information on surface plates and many other items, get your copy of the new Taft-Peirce Handbook.

T-P means Top Precision

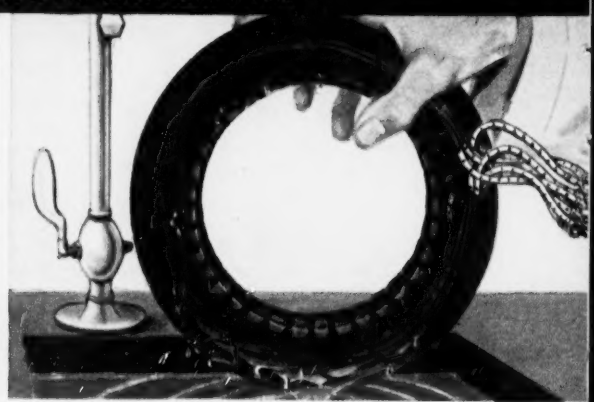
THE TAFT-PEIRCE MANUFACTURING COMPANY • WOONSOCKET, RHODE ISLAND



YOU GET EVEN LONGER MOTOR LIFE



PHYSICAL PROTECTION INCREASED 60 PER-CENT by a complete redesign of cast-iron frame and end shields. This motor is suitable for many jobs where ordinary dripproof motors should not be applied.



EXTRA ELECTRICAL STRENGTH is assured by use of new polyester film insulation. A silicone coating, Dri-film,* virtually eliminates stator insulation failure caused by moisture.

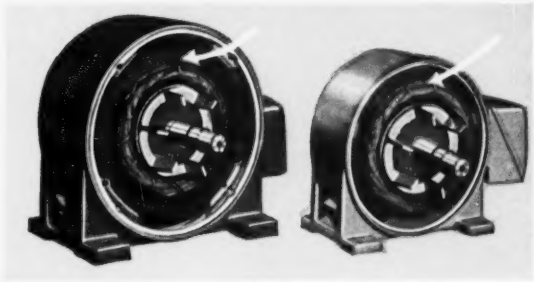
*REG. U.S. PAT. OFF.

TRI 55 CLAD THE LEADER IN MODERN MOTOR DESIGN

GENERAL ELECTRIC ANNOUNCES...

THE ALL-NEW TRI 55 CLAD MOTOR

REG U S PAT OFF



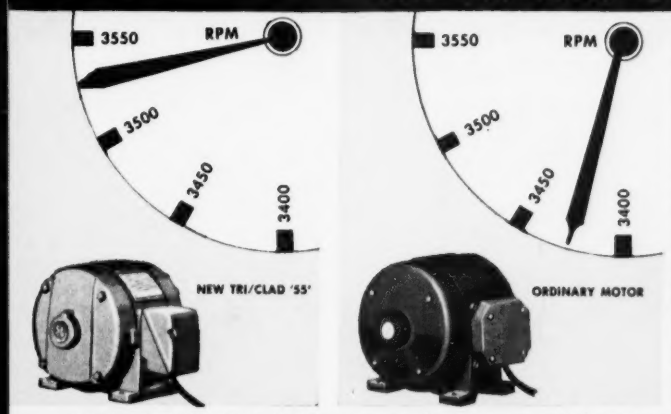
LIGHTER, SMALLER Tri/Clad '55' motors have been made possible through better use of space within the frame. Active materials (magnetic steel, copper) have not been sacrificed.

Complete Line of Dripproof, Enclosed Motors and Gear-Motors Available in Most Ratings in 1954

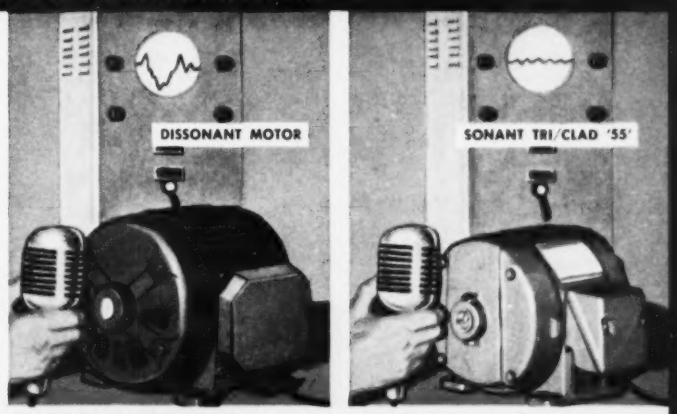
Here's the all-new Tri/Clad '55' motor — now available in NEMA 182 and 184 frame sizes.

You can get complete information on this dramatic motor achievement by writing for bulletin GEA-6013 on Tri/Clad '55' Dripproof motors, GEA-6012 on Tri/Clad '55' Enclosed motors, or GEA-6027 on Tri/Clad '55' Gear-motors, or by contacting your nearby G-E Apparatus Sales Office or G-E Motor Agent. General Electric Company, Section 648-1, Schenectady 5, N. Y.

YOU GET EVEN BETTER PERFORMANCE



HIGHER FULL-LOAD SPEEDS is only one of many improved characteristics of this new G.E. motor. Above shows comparison of an ordinary motor with the Tri/Clad '55' — both rated at 3600 rpm.



SONANT OPERATION of the new Tri/Clad '55' motor has been laboratory tested and proven. Motor operates at reduced noise level, and operating sound is pitched to a more pleasant frequency.

YOU GET EVEN MORE INSTALLATION AND MAINTENANCE SAVINGS



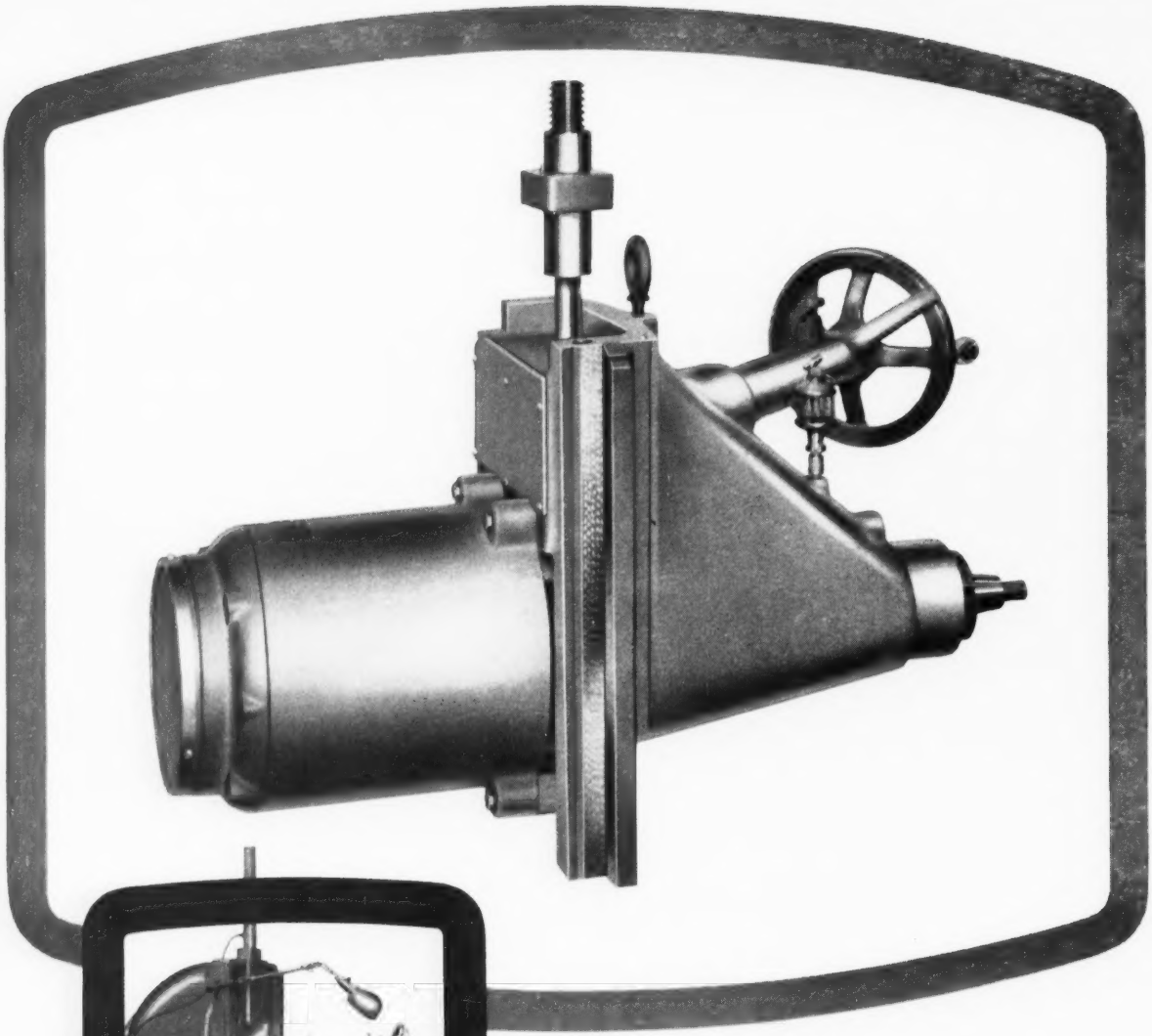
NEW BEARING SYSTEM allows this motor to run longer than other motors without regreasing. One reason—greatly improved synthesized grease with 8 times the mechanical stability of ordinary grease.

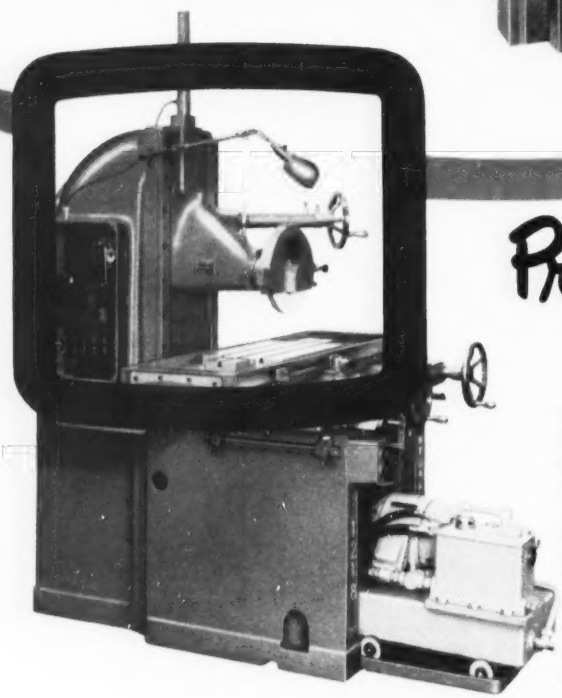


EASIER TO SERVICE, the new Tri/Clad '55' has larger conduit box diagonally split for simplified wiring. Perma-numbered leads mean that even clipped and stripped wires are instantly identified.

Progress is our most important product

GENERAL ELECTRIC





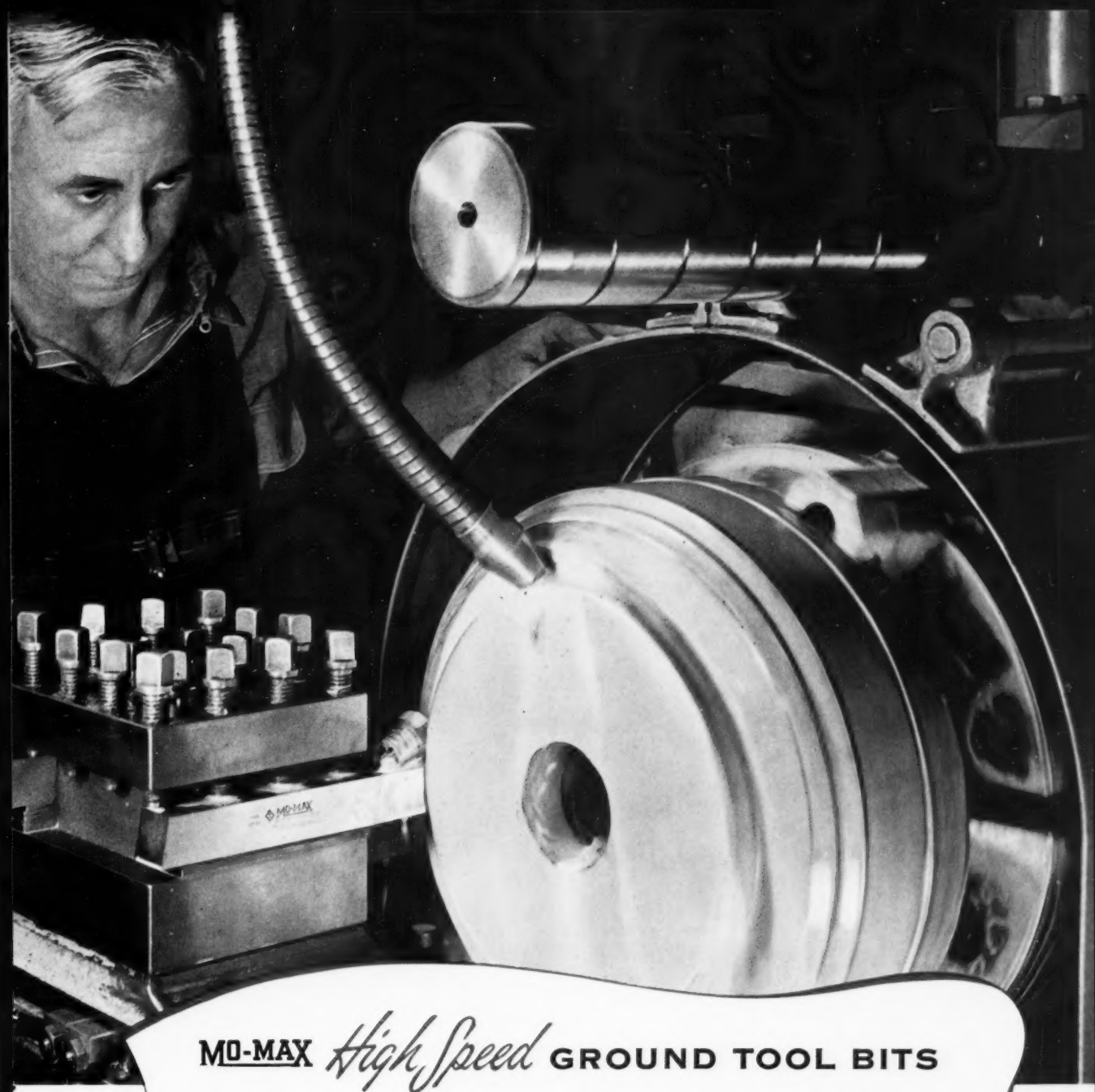
Precision in a Package

Here's the motorized spindle of the 1218 HYDRABRASIVE SURFACE GRINDER — the last word in hydraulically operated grinders. This piece of packaged precision delivers 3 HP direct to the 12" grinding wheel . . . for taking heavy cuts, for producing fine finishes, for maintaining the ultimate in flatness on every job. No. 1218 specifications include: wide cross travel (12") and moderate table length (18"); saddle ball ways; wide range of table speeds; accessories for wet or dry grinding. Send for latest complete catalog. Abrasive Machine Tool Company, 12 Dunellen Road, East Providence 14, Rhode Island.

Abrasive Quality is Reflected in the Finish of Your Product

ABRASIVE
ACCURACY BOOSTS PRODUCTION

For more information on products advertised, use Inquiry Card, page 247



MO-MAX *High Speed* GROUND TOOL BITS

Tough and Rugged, with Superior Cutting Qualities

MO-MAX and MO-MAX COBALT Tool Bits have been used economically for many years in thousands of plants... under all conditions. Without exception they have proved conclusively that they perform better than other high speed steels. Try the MO-MAX brand on your next job.

THE **CLEVELAND** TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

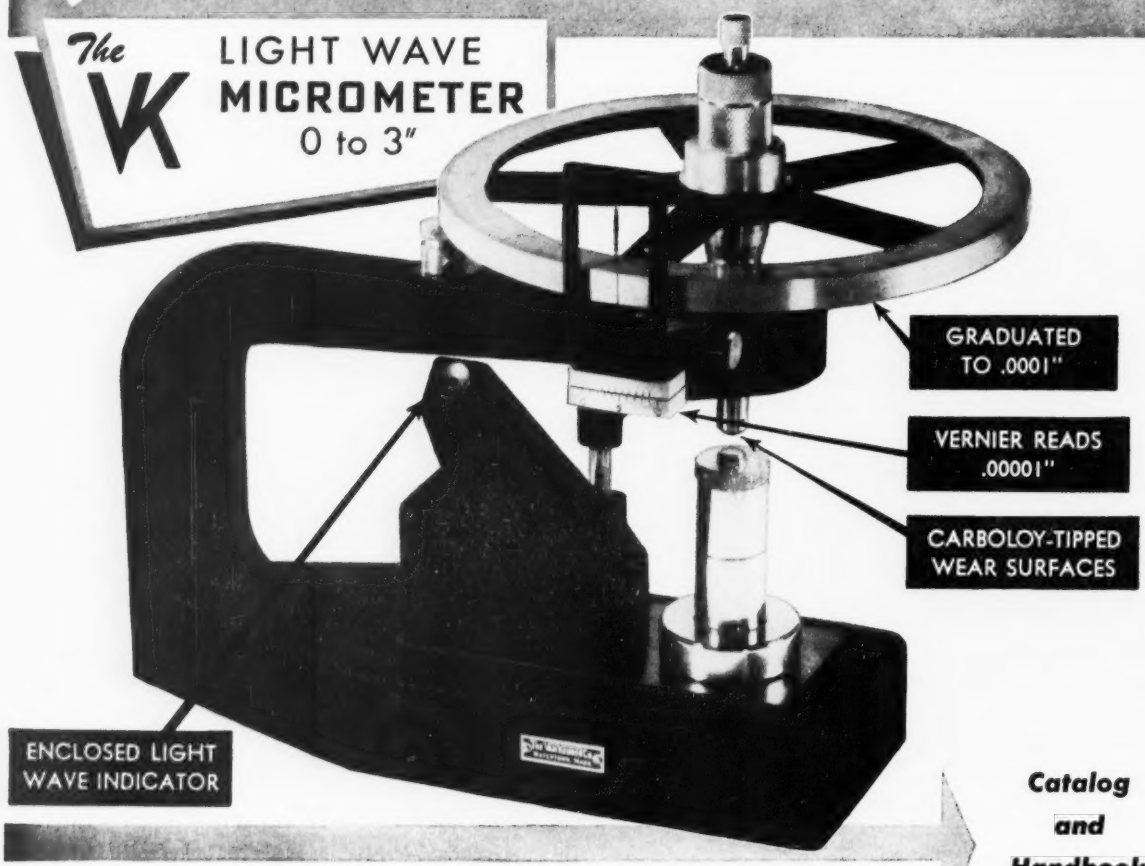
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58

E. P. Barrus, Ltd., London W. 3, England

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

for that last hundred-thousandth

The VK LIGHT WAVE MICROMETER 0 to 3"



The Van Keuren Light Wave Micrometer is an instrument of exceptional accuracy, ideal for measuring plug gages or small precision parts. Use it when you're after "that last hundred thousandth" involved in so many of today's measurements. The 0 to 3" instrument shown above has a ½" diameter, 40 threads per inch micrometer screw, which can be made with greater accuracy, and which has 3 times the wearing surface of an ordinary micrometer screw. It has an 8" diameter micrometer wheel, with .0001" graduations 1/10" apart. It has a non-parallax vernier index which enables readings to be made to .00001". It has an index lock and carboloy-tipped anvil and spindle. This sturdy, sensitive instrument weighs only 17 pounds, and is in reality a portable measuring machine of inbuilt and sustained accuracy.

The Light Wave Micrometer is not a comparator. No gage blocks are needed and no errors creep in from worn blocks. It is a direct source of dependable precision . . . fast, accurate and profitable.

Catalog and Handbook No. 35

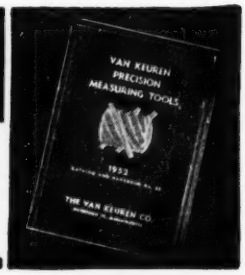
This 220-page volume represents years of research by the Van Keuren Co. It presents a simple and exact method of measuring screws and worms with wires, tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods. Ask for your copy . . . sent free on request by writing: The Van Keuren Company, 178 Waltham St., Watertown, Mass.

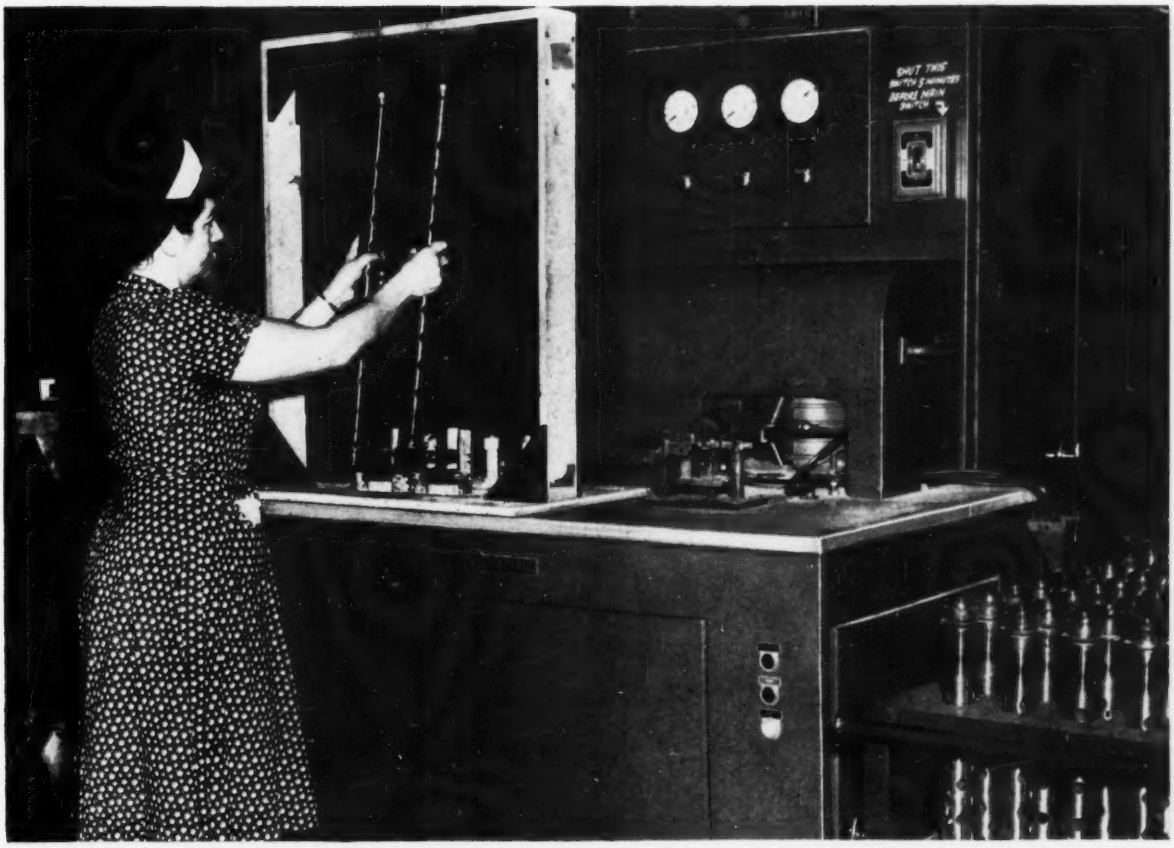
VK 35th YEAR

THE *Van Keuren* CO.,

178 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires Chrome Carbide Taper Insert Plug Gages





COMPACT G-E HEATERS FOR BRAZING FIT PERFECTLY INTO NEW STRAIGHT-LINE PRODUCTION SETUP AT THE SACO-LOWELL CO.

Rejects Eliminated in Gun-jacket Assembly

Saco-Lowell Company speeds production, cuts costs with G-E Induction Heaters

"In planning our machine-gun production program, we find G-E induction heaters assure us the high-quality brazing necessary to meet strict Ordnance Department requirements," says F. A. Skinner, Chief Engineer, Edwards Plant, Saco-Lowell Shops, Biddeford, Maine.

At Saco-Lowell, brazing rejects are a thing of the past. Only spot checks are necessary for product inspection, because G-E heaters provide a strong, uniform braze time after time. Saco-Lowell saves on operator training too, because use of these semi-automatic G-E heaters is mastered easily in a few hours.

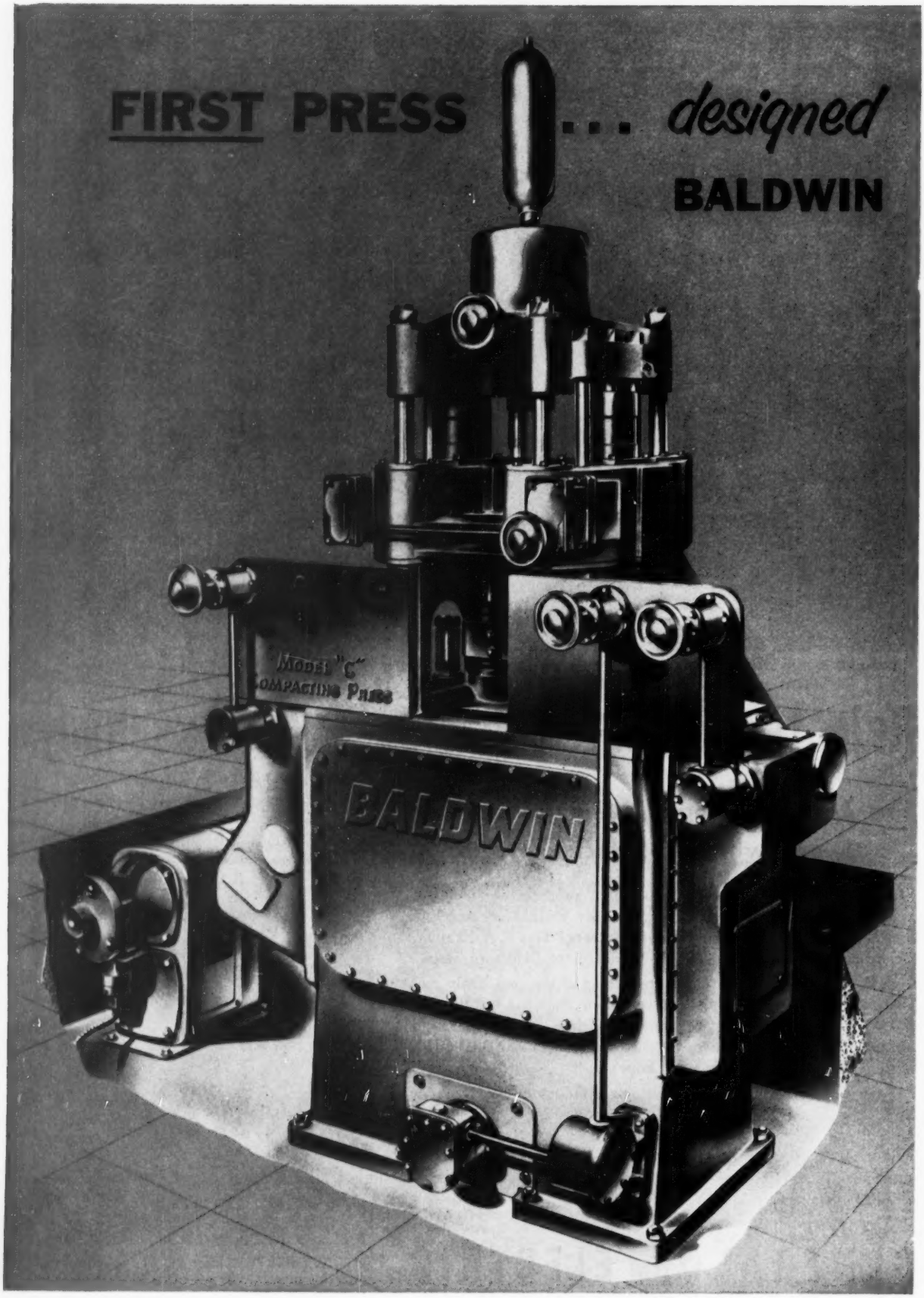
To learn how you can profitably apply induction heat to your metal processing—in brazing, forging, hardening, or annealing—contact your nearest G-E Apparatus Sales representative today. And write now for new, modern-metal-processing bulletin GEA-5889 on furnace and induction brazing to General Electric Company, Section 720-122, Schenectady 5, N. Y.



SELECTIVE HEAT produces this clean, strong bond of bearing breach to barrel jacket. Sixty such joints are brazed per hour.

GENERAL ELECTRIC

For more information on products advertised, use Inquiry Card, page 247


FIRST PRESS ... designed
BALDWIN
BALDWIN

Specifically for Powdered Metal

MODEL "C" COMPACTING PRESS

The new Baldwin-Defiance Model "C" compacting press, can be seen in action for the *first* time at the Metal Exposition, October 19-23 in Cleveland. A mechanical, four column, crank-type press with pneumatic clutch and brake, Model "C" was developed by Baldwin press-development engineers specifically to answer the *pressing* problems of the growing powdered metals industry.

Baldwin-Lima-Hamilton's experience in adopting standard compacting presses for powdered metals is unequalled. B-L-H knows the special needs of powdered metallurgy and to meet your requirements, designed Model "C" completely new from scratch, incorporating all of these features.

SEALED MECHANISM SHUNS ABRASION

The entire press mechanism, including a 20-hp motor, is completely enclosed and sealed to prevent entrance of abrasive materials, making it suitable for compacting powdered metal.

HYDRAULIC HEAD CONTROLS DENSITIES

Accurate pressure is assured by a hydraulic head whose ram supplies opposing pressure for the upper punch. Thus, if compressing pressure exceeds the hydraulic accumulator setting, the upper punch "gives" to and is held within the limit of the setting. This assures uniform densities of compacts, prevents overloading and prolongs the life of tools and press.

DESIGNED TO PRECISE FILLING OF DIE

This press uses an air-operated shuttle type feeder which moves from under a stationary hopper to a position over the die. The shuttle is supported on guide rods with a spring loaded cutoff ring to prevent loss of material. The depth of fill and the stroke of the bottom punch are adjusted by two separate handwheels, eliminating shimming the bottom punch to bring it flush with the top of the die. The relative position of the core rod to the die is also adjustable to aid in controlling the fill when making counterbored parts.

AUTOMATIC LUBRICATION

The lubricating system is equipped with a motor driven gear type lubrication pump, a filter, and a pressure switch. The main drive motor cannot be operated unless there is oil pressure in the lube system. Should the oil pressure drop below the pressure switch setting the main drive motor will stop.

CONTROLS PERMIT FIVE CYCLING VARIATIONS

1. Continuous run.
2. Press will stop at any pre-determined point in its cycle, dwell up to 15 seconds (adjustable) and start automatically.
3. Single stroke (stops at pre-determined point in cycle and starts only when start button is pushed).
4. Single stroke with dwell (combination of steps 2 and 3).
5. Press can be inched through its cycle.

SEE IT AT THE SHOW!

If you use or are planning to use powdered metals, it will pay you to visit Baldwin Booth No. 1139 at the Metal Exposition in Cleveland, Oct. 19-23. See for yourself the many exclusive features which Baldwin has incorporated in Model "C" Compacting Press, *the first press ever designed from scratch specifically for powdered metals.*

OR WRITE FOR NEW BOOKLET

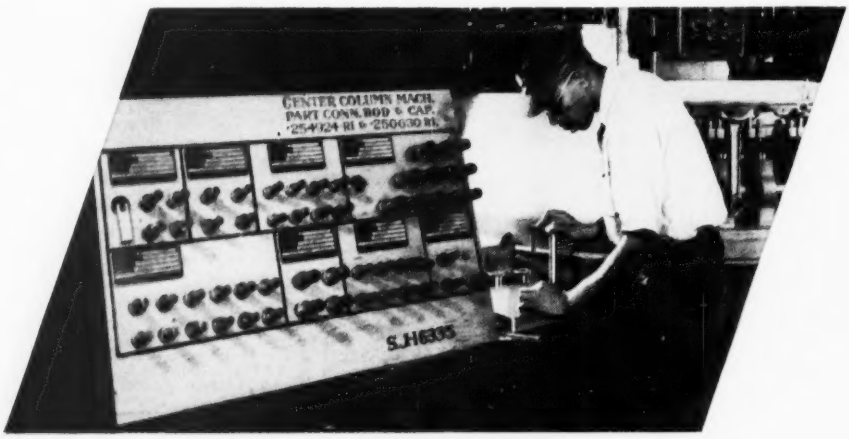
If you are going to miss the metal show, let us send you the booklet on Model "C" . . . prepared specially to give you full description and specifications. Address: Dept. 4616, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

BALDWIN BLH LIMA-HAMILTON

BALDWIN-LIMA-HAMILTON

PHILADELPHIA 42, PA. • OFFICES IN PRINCIPAL CITIES

SCULLY JONES Tool Board and Gages



Accurate pre-setting stops reamer and drill breakage...

saves 40% setup time for International Harvester

Here's how International Harvester Company profits from an efficient, *two-platoon* system for replacing cutting tools on this Footburt 6-station Center Column Drill.

First—a special Scully-Jones Tool Board gives the operator a convenient *tool file* . . . a complete set of newly sharpened drills and reamers ready to replace broken or worn tools at a moment's notice. Each tool is properly identified as to size, station, tool number and adapter size . . . contributing valuable *human factors* to help solve setup problems.

Second—Scully-Jones Height Gages simplify and speed setting of tools to correct cutting depths. Duplicating the holding method of the machine, gages eliminate need for *in-the-machine* adjustments and drilling of sample parts to check accuracy of settings. With 56 perishable tools in the machine, this fast, foolproof method reduces downtime, gives International Harvester a bonus of 63 parts every eight-hour shift.

Third—Scully-Jones Quick-Lock Adjustable Adapters put the *firing-pin* in this entire method by providing tool holders with infinitely fine depth adjustments, accurate fit in spindles, easy insertion and ejection of tools from the machine.

Results in management terms?—Accurate settings reduce tool breakage. Setup time is cut 40%. A saving of $620 is gained per shift per year and 63 additional parts are produced every eight-hour shift!

To investigate improved methods for adapting your cutting tools to the machine and the job, call your Scully-Jones representative or stocking distributor, *today!*

THERE'S A SCULLY-JONES PRECISION TOOL FOR EVERY HOLDING OR DRIVING NEED



Quick-Lock Adjustable Adapters

Permit accurate adjustments in cluster of spindles. End guesswork on fine adjustments. Speed tool changes.



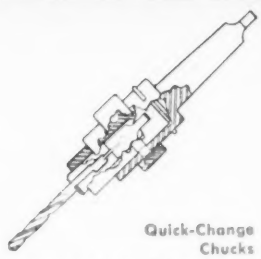
Spindle Extension Assemblies

For driving shank-type tools in multiple-spindle machines. Individual spindle adjustments are fast and easy.



Style "JT" Floating Holders

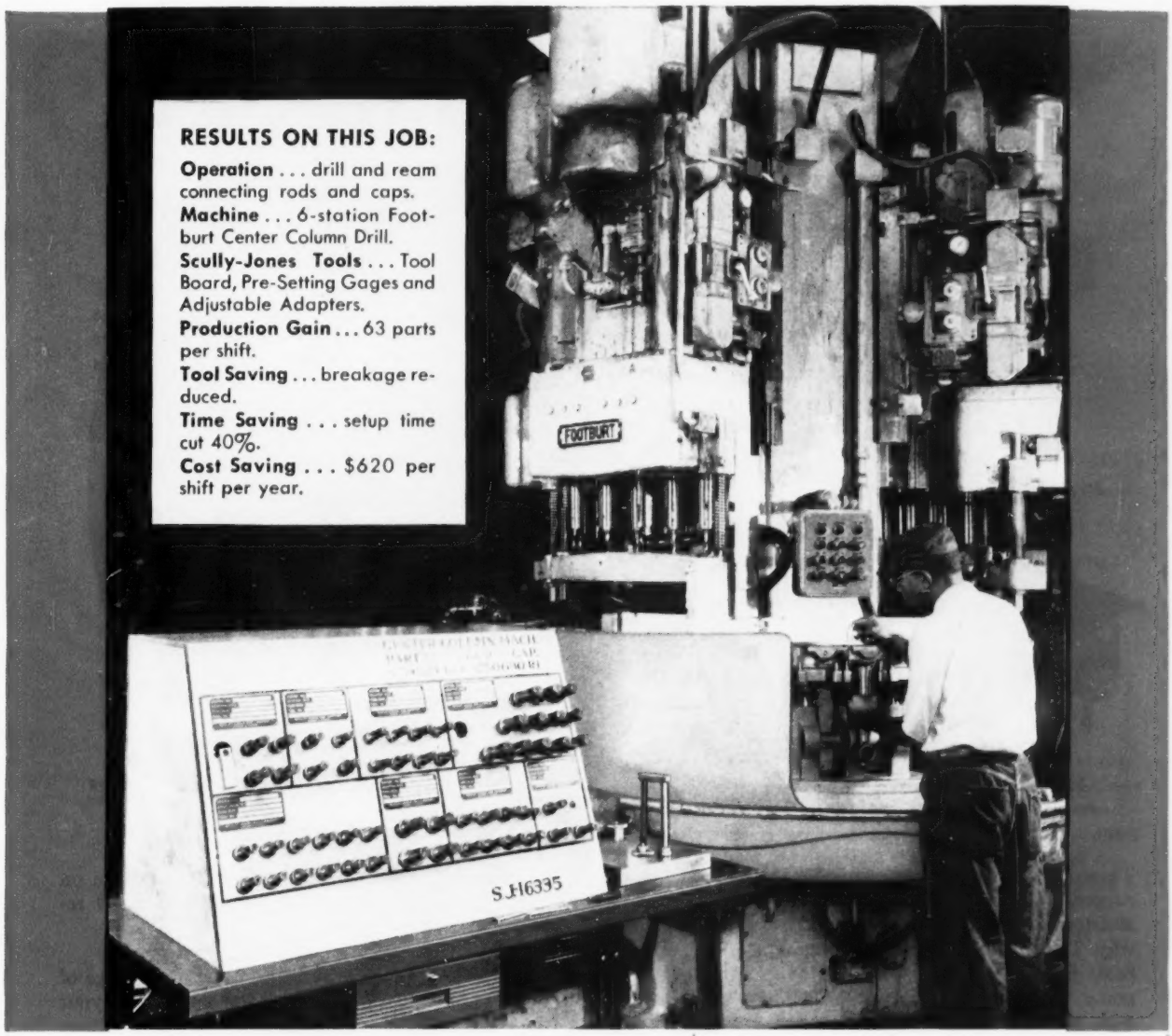
Reduce scrap and tool breakage on multiple-spindle machines. Unrestricted float, accurate depth adjustment.



Quick-Change Chucks

Change tools in "seconds" without stopping spindle. Speed production. Hold collet firmly. Give positive drive.

speed setup, save tool life!



RESULTS ON THIS JOB:

Operation . . . drill and ream connecting rods and caps.
Machine . . . 6-station Footburt Center Column Drill.
Scully-Jones Tools . . . Tool Board, Pre-Setting Gages and Adjustable Adapters.
Production Gain . . . 63 parts per shift.
Tool Saving . . . breakage reduced.
Time Saving . . . setup time cut 40%.
Cost Saving . . . $620 per shift per year.

SCULLY JONES

Precision Holding
FOR HOLDING PRECISION

Scully-Jones and Company, 1906 South Rockwell Street, Chicago 8, Illinois

MORE FACTS—Send for free catalog describing Scully-Jones "Precision Holding" Tools. Paste coupon to letterhead or post card and mail today.

Gentlemen: I'm interested in learning more about Scully-Jones Tools.

☐ Please send Bulletin No. 19-50 describing Pre-Setting Gages and Tool Boards.

☐ Send catalog on your complete line.

Name _____

Company _____

Address _____

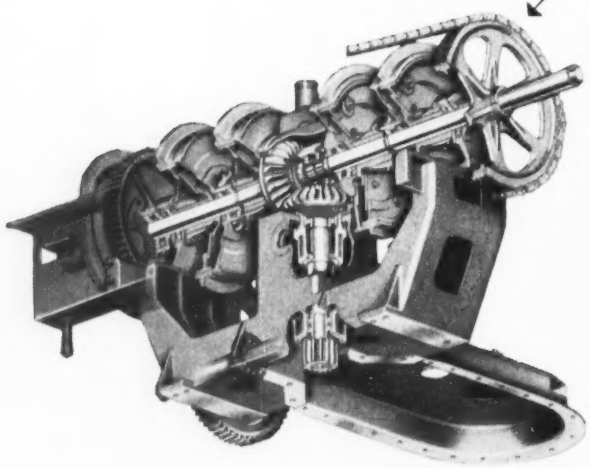
City _____ State _____

For more information on products advertised, use Inquiry Card, page 247

For positive bearing protection

THEW-LORAIN *specifies* KLOZURE* Oil Seals





At the left is a cut-away illustration showing the "heart" of Thew-Lorain's "TL" Series of power cranes and shovels—the clutch shaft bevel gears which operate the turntable of Lorain TL-25's. Dependable KLOZURES protect 5 of the clutch shaft bearings under the most rugged service conditions where operating temperatures often exceed 250° F.



MODEL 53 KLOZURE MODEL 51 KLOZURE

Cross-sectional views of finger-spring KLOZURES; hycar sealing element for normal services—silicone rubber sealing element for elevated temperatures.

Thew-Lorain power shovels and cranes must withstand rugged operating conditions—where dust, dirt, and moisture are the rule rather than the exception. That's why TL engineers specify dependable KLOZURE Oil Seals for the inner clutch assembly (illustrated) and many other bearing applications. These superior oil seals give maximum bearing protection by keeping the lubricant *in*, dirt and moisture *out*.

Prolong the life of your bearings! Standardize on Garlock KLOZURES and prevent breakdowns and resulting losses in production.

KLOZURE Oil Seals are made in a complete range of sizes and in many models. For full information call your Garlock representative or write for KLOZURE Catalog No. 10.



THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Sales Offices and Warehouses: Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Denver Detroit • Houston • Los Angeles • New Orleans • New York City • Palmyra (N. Y.) • Philadelphia • Pittsburgh • Portland (Ore.) • Salt Lake City • San Francisco • St. Louis • Seattle • Spokane • Tulsa.

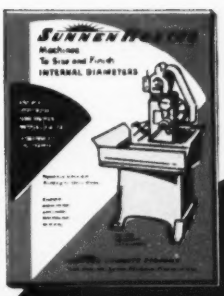
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

*Registered Trademark

GARLOCK

PACKINGS, GASKETS, OIL SEALS, MECHANICAL SEALS, RUBBER EXPANSION JOINTS

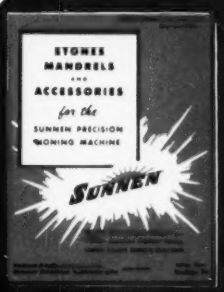
For more information on products advertised, use Inquiry Card, page 247



No. 50 Sunnen Honing Machines



No. 51 Sunnen Portable Cylinder Hones



No. 505 Sunnen Honing Supplies & Accessories



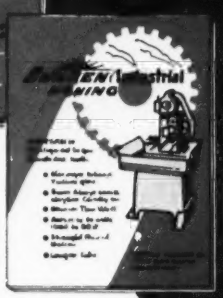
No. 57 Sunnen Portable Honing



No. 55 Sunnen Tool Room Honing



No. 58 Sunnen External Hones



No. 60 Sunnen Honing Case Histories

These 7 FREE BOOKLETS

Can Help You . . .

- ✓ Produce Accurate Internal Diameters
- ✓ Produce Accurate External Diameters
- ✓ Reduce Assembly Time
- ✓ Cut Production Costs on Internal Finishing
- ✓ Get Absolute Interchangeability of Parts with Precise Fits
- ✓ Get the Accuracy of Lapping in 1/5 the Time
- ✓ Eliminate Selective Fitting

SUNNEN® HONING Has Solved Such Problems For Hundreds of Other Companies . . . and may be the solution to some of your production headaches.

If your problem is how to meet newer, more exact specifications on bores and shafts, you'll want these booklets. They tell you how alert manufacturers are improving their products by honing . . . making them last longer and run smoother and cooler . . . making higher speeds permissible . . . all by using Sunnen Honing to produce smooth, accurate bushings and bores, as well as spindles, shafts, plungers and similar parts.

Use the coupon for your FREE booklets — no obligation.

762

To: SUNNEN PRODUCTS COMPANY, 7983 Manchester Ave., St. Louis 17, Mo.

☐ Please send me all 7 of the booklets.

Please send me the following booklets:

☐ No. 50 ☐ No. 51 ☐ No. 505 ☐ No. 57
☐ No. 55 ☐ No. 58 ☐ No. 60

Name .....

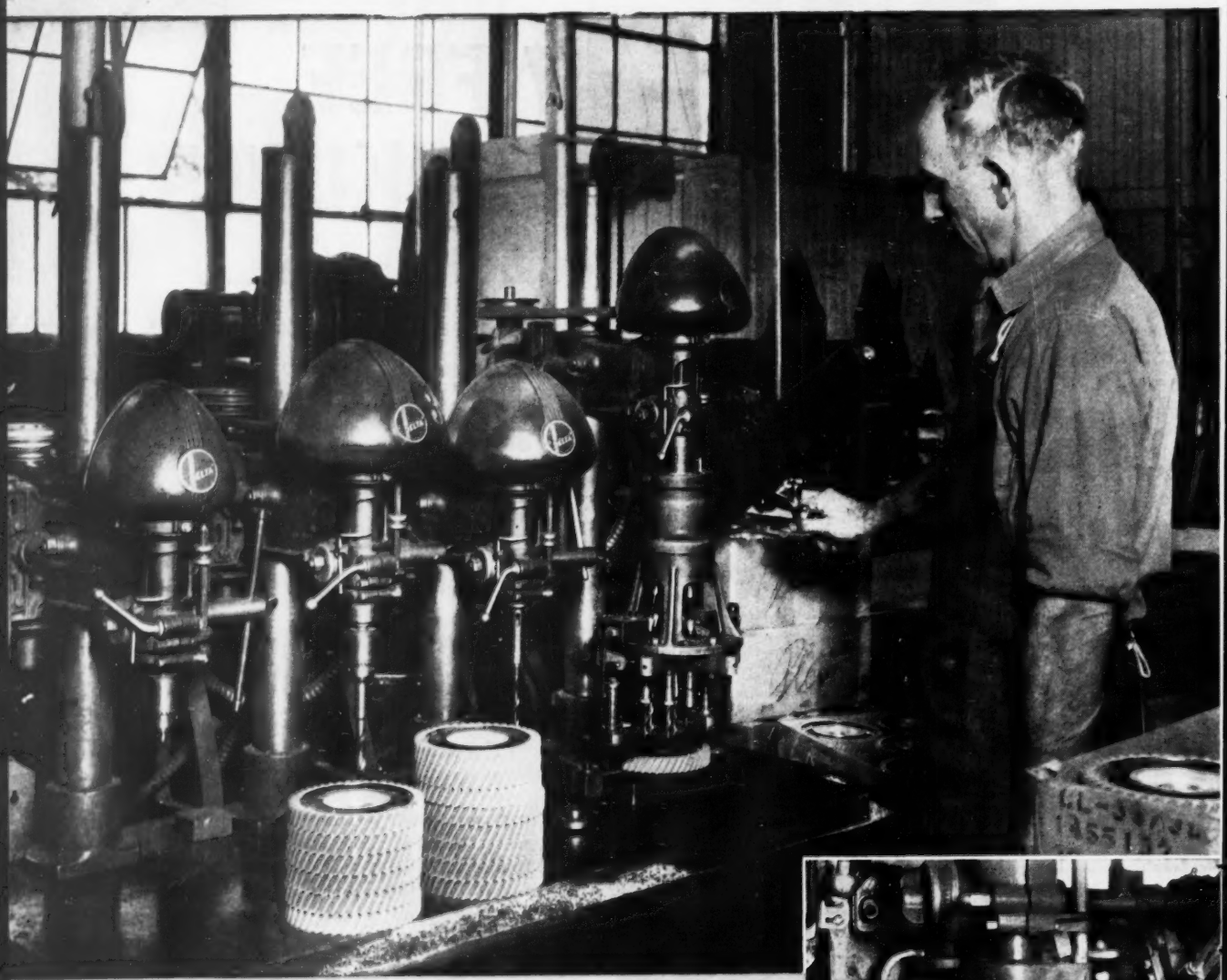
Company .....

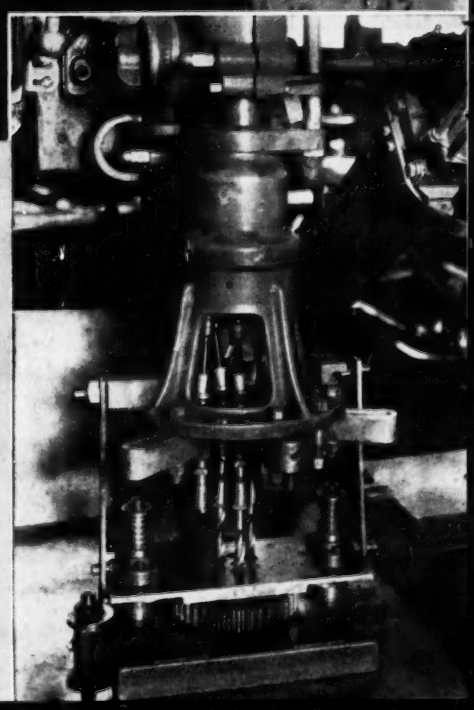
Address .....

City ..... Zone ..... State .....

SUNNEN® PRODUCTS CO.
7983 Manchester Avenue, Saint Louis 17, Missouri
Canadian Factory: Chatham, Ontario

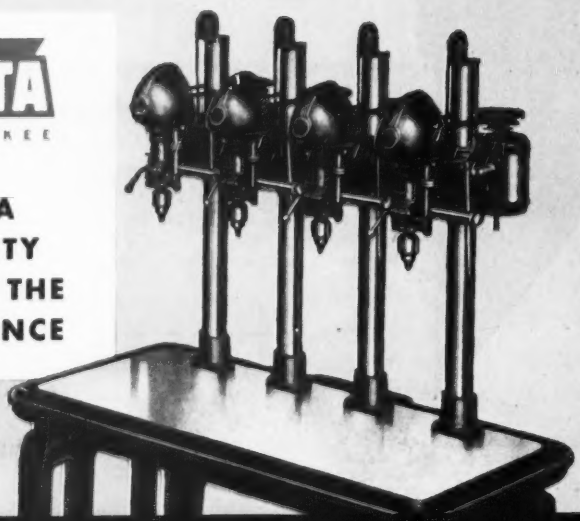
Our Production Jumped





DELTA
MILWAUKEE

DELTA QUALITY MAKES THE DIFFERENCE



300% with our First

DELTA Drill Press

says CHARLES LASLO, Superintendent, CLOYES GEAR WORKS, Cleveland, Ohio

4-spindle 14" drill press drills 4 to 6 holes at one time in timing gears—Chamfering is free operation—Machine used 30-40 hours per week, maintenance negligible.

- ***Another example of improved direct labor efficiency by using DELTA tools***

"In our pre-Delta era," says Mr. Laslo, "we used a 4-spindle drilling machine with flat-belt drive to drill and chamfer holes in timing gears used by leading auto builders. Belt slippage lost a lot of production and belt maintenance was high. Pieces were held by hand, and precision tolerances were hard to maintain.

"We bought a Delta 4-spindle, 14" drill press to do the combined drilling and chamfering operation on the gears. The No. 1 spindle was equipped with a fixture to hold the work, a multiple spindle head to do all the drilling, and a power feed.

"Chamfering became a 'free' operation because, while the No. 1 spindle goes through its automatic cycle, the operator chamfers the already-drilled piece from the previous cycle, puts it in the finished stock box, and gets a new piece ready.

"These operations are absolutely cost-free from a labor standpoint—compared with the old method.

"Also when time studies on one product proved that handling operations accounted for ⅓ of total cost, we installed another Delta single-spindle 14" drill press mounted on a wheel-equipped table. By moving the tool we eliminated most of the moving of the work.

"Recently, to deal with heavier volume we bought a Delta 17" drill press that drills $\frac{1}{16}$" and $\frac{27}{64}$" holes with extraordinary efficiency and accuracy."

Results speak for themselves:

- **Quality greatly improved—fewer rejects**
- **Operations eliminated**
- ***Production quadrupled***

Thousands of other Delta users are getting the same labor savings from multiple set ups that include the Delta 17" power feed drill press.

Can you win new "highs" in volume and quality? —most likely, yes! It's surely worth a little no-cost exploration. Talk to your Delta dealer—listed in the classified pages of your phone book under "Tools" or "Machinery"; and use the coupon to get the latest Delta AB-52 Catalog.

DELTA QUALITY POWER TOOLS

Another Product of **Rockwell**

Delta Power Tool Division
Rockwell Manufacturing Company
614A N. Lexington Ave., Pittsburgh 8, Pa.

( ) Please send me the name of my nearest Delta dealer
( ) Please send me the latest AB-52 catalog

Name _____
Position _____
Company _____
Street _____
City _____ Zone ___ State ___

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

ABRASIVES

See Discs, Abrasive

ABRASIVES, HONING

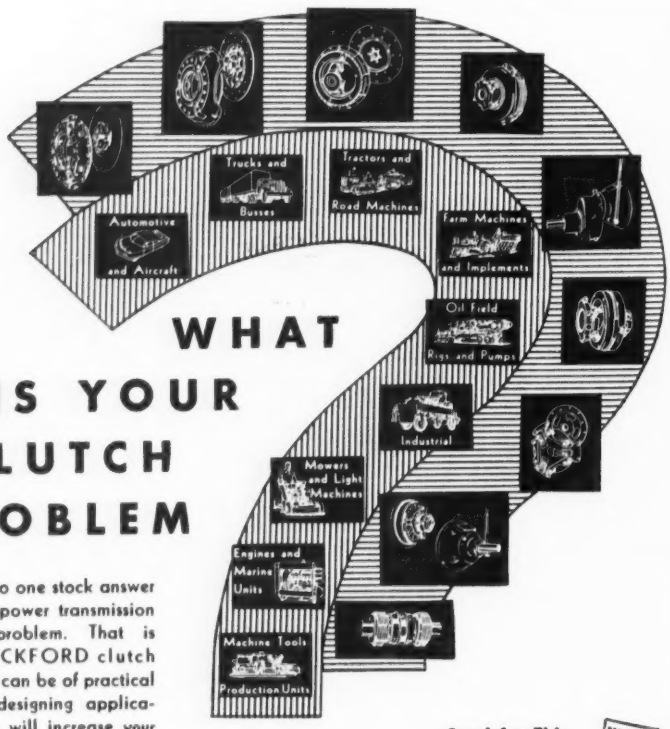
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

ABRASIVES, Polishing, Tumbling, Etc.

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill..
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic

American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.



WHAT IS YOUR CLUTCH PROBLEM

There is no one stock answer to every power transmission control problem. That is why ROCKFORD clutch engineers can be of practical help in designing applications that will increase your product's efficiency — make substantial savings in cost — and reduce servicing downtime. Send a print or a description of your clutch need for their recommendations — based on many years of clutch application experience and the extensive ROCKFORD line of clutches, power take-offs and speed reducers.



Send for This Handy Bulletin



Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

BW

ROCKFORD CLUTCH DIVISION
Borg-Warner
410 Catherine St., Rockford, Illinois

ROCKFORD CLUTCHES

Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York 1, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOY STEELS, High Temperature

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

ALLOYS, Aluminum

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

ALLOYS, Non-Ferrous

American Brass Co., 25 Broadway, New York.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ARBOR PRESSES

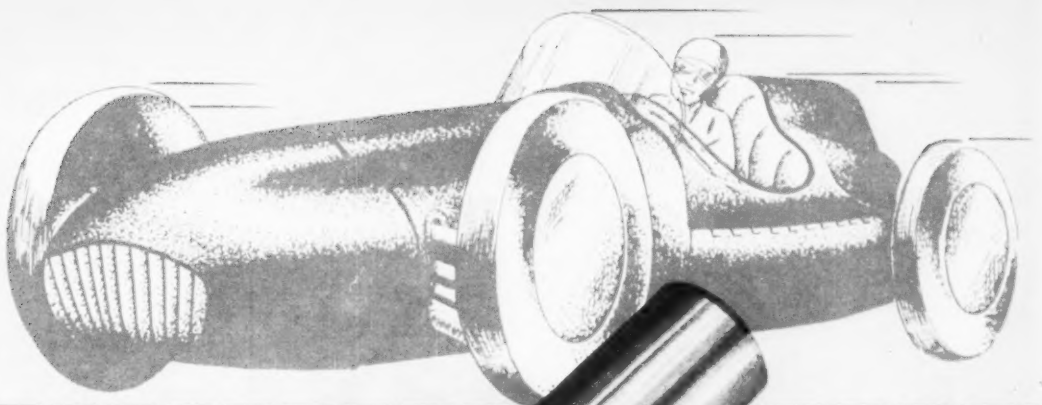
See Presses, Arbor

ARBORS AND MANDRELS

Beaver Tool & Engineering Corp. (Arbors, only), 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Erickson Tool Co., 2309 Hamilton, Cleveland, Ohio
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.

(*Continued on page* 292)

For more information on products advertised, use Inquiry Card, page 247



R and L TAP AND DIE HOLDER



WHEN SECONDS COUNT

The R and L TAP AND DIE HOLDER readily changes from right to left due to the patented instant release action. It can also be adapted to work on short threads, do bottom tapping, or die up to shoulders.

Releasing or non-releasing, (also furnished for acorn dies), this tool is made in a complete range of sizes from ⅝" diameter shank to 1½" diameter shank.

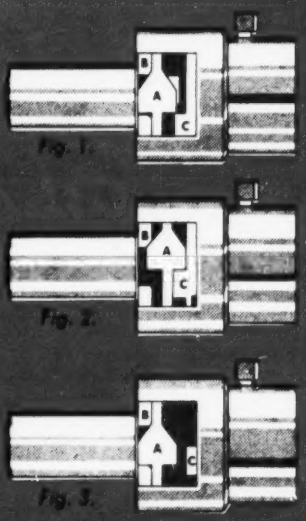


Fig. 1. Ready to start threading operation.

Fig. 2. Instantly engaged to full contact.

Fig. 3. Fully released. Note ample clearance between contact points of clutch.

Write for Catalog

RIGHT R and L LEFT TOOLS

1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS. (ALSO AVAILABLE FOR ACORN DIES) • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER • RECESSING TOOL • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL



GOSS & DeLEEUW

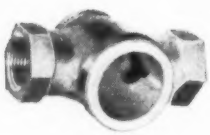
AUTOMATIC CHUCKING MACHINES

perform one to three operations in sequence or simultaneously . . .

TO CUT PRODUCTION COSTS...

More completely finished parts at the end of the day with no partly finished pieces lying around is the regular accomplishment of Goss & De Leeuw "1-2-3" chuckers. It means complete finishing on one, two or three ends simultaneously or in sequence without tool resetting, rechucking or parts handling. Machining operations may include boring, facing, turning and threading.





Change over from job to job is simple. Cost-cutting is assured on long or short runs. Goss and DeLeeuw Chucking Machines are the only standard machines of their type which operate the "1-2-3" way to reduce costs per piece and step up the number of pieces per hour.



Investigate the opportunities offered by these machines on your production by sending samples of your work for time and cost estimates—Ask for illustrated descriptive literature.

GOSS & DeLEEUW
QUALITY · PRODUCT · QUANTITY · PRODUCTION

GOSS *and* DeLEEUW
MACHINE COMPANY, *KENSINGTON, CONN., U.S.A*

Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Supreme Products, Inc., 2222 So. Calumet, Chicago 16, Ill.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Western Tool & Mfg. Co., 1640 E. Wheeler St., Springfield, Ohio.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

BABBITT

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, Ill.

BALANCING EQUIPMENT

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Cosa Corp., 405 Lexington Ave., New York 17.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
Keller Tool Co., Grand Haven, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pope Machinery Corp., Haverhill, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Thor Power Tool Co., Aurora, Ill.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

BALLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Kennametal, Inc., Latrobe, Pa.

BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BARS, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., (Cold Drawn), Republic Bldg., Cleveland, Ohio.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded

Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.

BEARINGS, Babbitt

Bunting Brass & Bronze Co., Spencer and Carlton Ave., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

BEARINGS, Ball

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp. 402 Chandler Bldg., Jamestown, N. Y.
New Departure Div., General Motors, Bristol, Conn.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Torrington Co., Torrington, Conn.

(*Continued on page 294*)

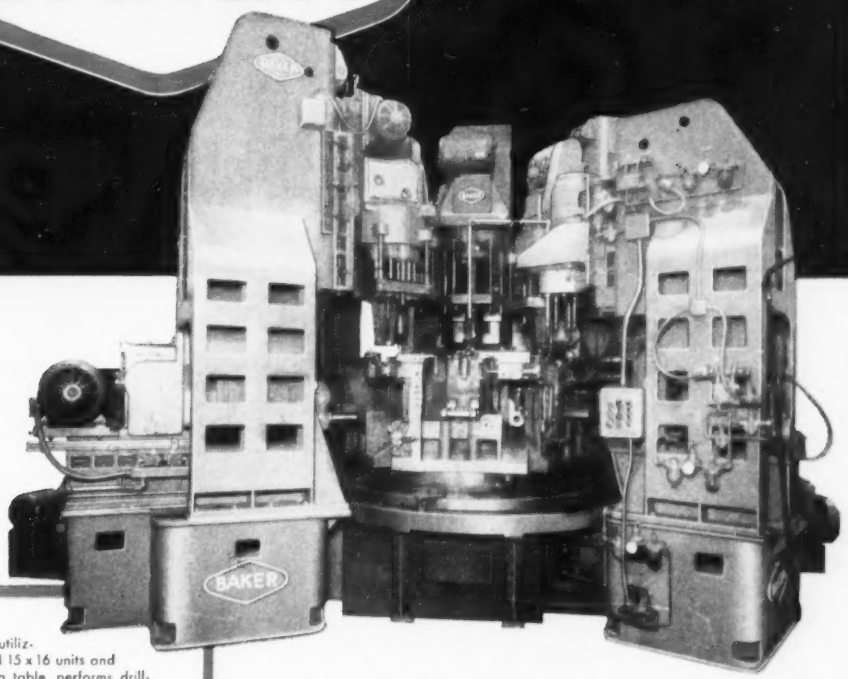
For more information on products advertised, use Inquiry Card, page 247

ANOTHER
COMPLEX
DRILLING PROBLEM

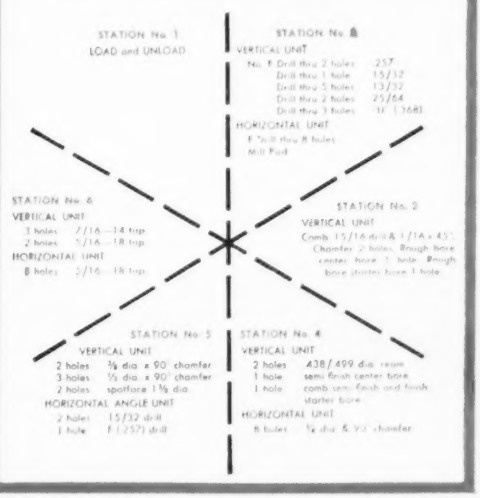
SOLVED

by

with a BAKER SPECIAL MACHINE



Baker Multi-Operation Machine utilizing standard Baker 7½ x 16 and 15 x 16 units and a 72" six-station power indexing table, performs drilling, chamfering, boring, counterboring, and tapping operations on clutch housings at the rate of 80 parts-per-hour at 100% efficiency.



Baker Special Drilling Machines, composed of standard Baker units arranged to suit each individual problem, are designed for *productivity*. Units arranged in vertical, horizontal and angular planes perform multiple operations *faster . . .better . . . automatically* . . . with greater accuracy and efficiency. Consult Baker engineers for a better solution to your drilling problems.

..SINCE 1867

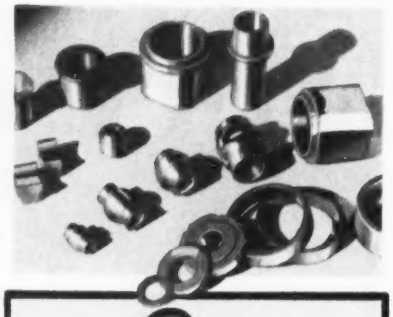
BAKER BROTHERS, INC. Toledo, Ohio

DRILLING...TAPPING...KEYSEATING and CONTOUR GRINDING MACHINES

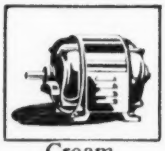
Ideal for certain applications



Washers



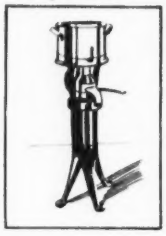
Electric Motors





Cotton Pickers

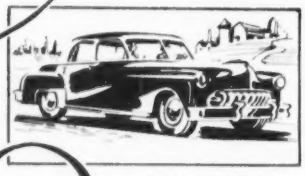
Cream Separators



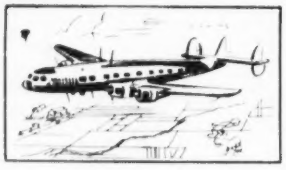
JOHNSON
Ledaloyl
SELF LUBRICATING
BEARINGS and parts



Business Machines



Automobiles



Airplanes

THESE low cost, porous, self-lubricating bearings may be the answer to some of your bearing problems. If so, you will make substantial savings. Johnson Ledaloyl Bearings and Parts are molded under high pressure from powdered metal . . . no machining necessary . . . hence the low unit cost in large quantities. Some industrial applications are: places difficult or impossible to lubricate, uses where heavy duty service is not a factor, installations requiring self-aligning bearings, and others. New uses are being discovered every month. Johnson engineers will gladly help you to determine whether you can use Ledaloyl bearings to your advantage. Write today.

Popular sizes of straight, flanged and self-aligning bearings available from stock. Write for catalog.

JOHNSON BRONZE COMPANY
520 South Mill St., New Castle, Pa.

JOHNSON B BEARINGS
Sleeve-Type

BEARINGS, Bronze and Special Alloy

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

BEARINGS, Lineshaft

Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Orange Roller Bearing Co., Inc., Orange, N. J.
Torrington Co., Torrington, Conn.

BEARINGS, Roller

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., Harrison, N. J.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Self-Lubricating (Oilless)

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Tapered Roller

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Thrust

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearing Co., Inc., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BELT SHIFTERS

Standard Pressed Steel Co., Jenkintown, Pa.

BELTING, TRANSMISSION

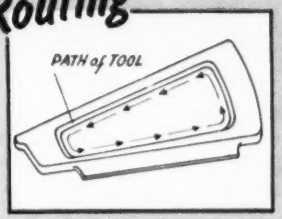
Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

(Continued on page 296)

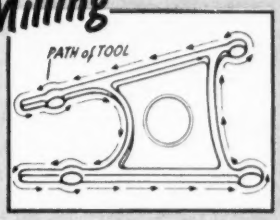
For more information on products advertised, use Inquiry Card, page 247

NEW three-dimensional tracer-controlled high-precision TURCHAN HYDRO-ROUTER

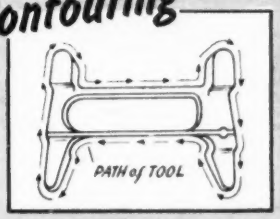
Routing



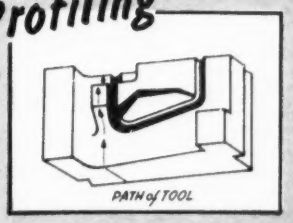
Milling

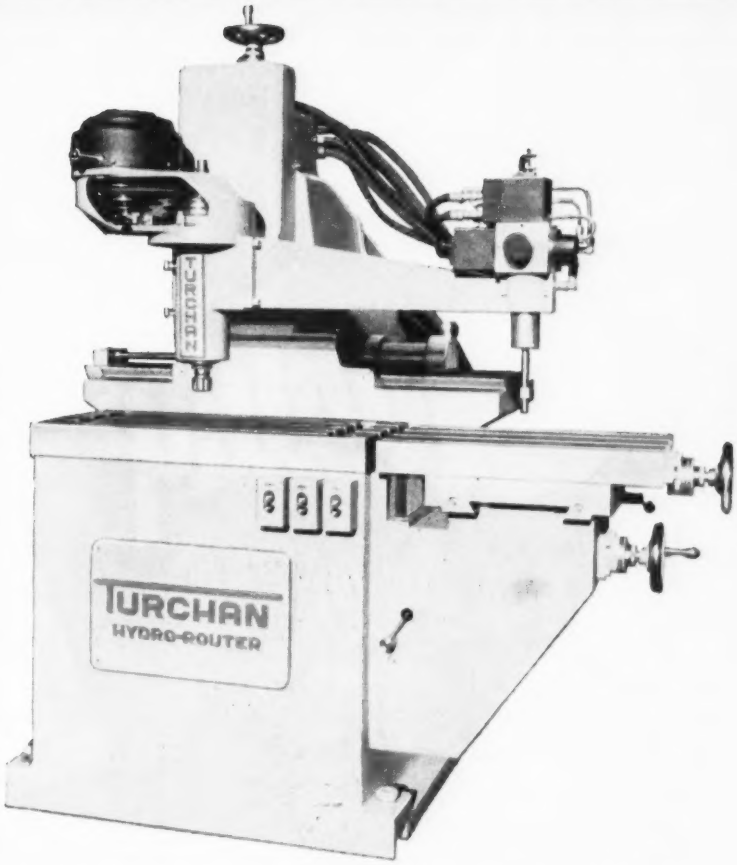


Contouring



Profiling





Greater sensitivity, accuracy and increased duplicating speed result in hours of costly time saved on irregular forms and parts with Turchan's new Hydro-Router. Controls are grouped within easy reach of operator; virtually eliminating fatigue. Infinitely variable three-dimensional tracer control of vertical, cross and longitudinal spindle movements produces a superior finish at extreme accuracy of duplication. Turchan Hydro-Routers are available in many sizes; each with a wide range of speeds and feeds for carbide work and all metals. Write for full information.

See the "Turchan Story" in Sweet's '54 File

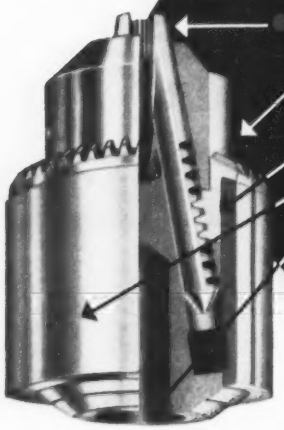
. . . under Machine Tool Catalogs, or write Turchan direct for your individual copy. No obligation.

Turchan FOLLOWER MACHINE COMPANY

Machine Tools Division, 8259 Livernois Avenue, Detroit 4, Michigan

For 20 years, designers and builders of automatic hydraulic tracer-controlled equipment for standard machine tools and special machines

Here are the points...



Jaws Nickel Chrome Moly Alloy Steel

Key Holes: do not extend into body cavity thereby sealing out dirt

One Piece Geared Nut Construction

Entire Chuck Body Hardened inside and out

Taper Bore hardened and ground

Chucks and Keys interchangeable with other makes

...that make

Quality Supreme BRAND Chucks



Every chuck is individually checked for accuracy . . . you can depend on Supreme Chucks for trouble-free performance and long wear.

SUPREME PRODUCTS, INC.
2222 S. CALUMET AVE., CHICAGO, ILLINOIS

the chuck that lives up to its name . . . SUPREME

BENCHES, Work, and Bench Legs
Standard Pressed Steel Co., Jenkintown, Pa.

BENDING MACHINES, Angle Iron, Plate, Etc.
Consolidated Mch. Tool Corp., 565 Blossom Rd., Rochester, N. Y.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.

BENDING MACHINES, Hydraulic
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 30 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

BENDING MACHINES, Pipe
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York Pa.
Pines Engineering Co., Inc., Aurora, Ill. (Hydraulic)
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BLAST CLEANING EQUIPMENT
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pangborn Corp., Hagerstown, Md.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

BLOWERS
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

BLUING LAYOUT
Dykem Co., 2303 P. N. 11th St., St. Louis 6, Mo.

BOILER TUBES
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Steel and Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

BOLT AND NUT MACHINERY
Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLTS AND NUTS
Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

BOLTS, T-Slot
O. K. Tool Co., Milford, N. H.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.

(*Continued on page 298*)

For more information on products advertised, use Inquiry Card, page 247



It's good to see your smile of *satisfaction*, Frank!

Mr. Franklin, foreman, (Frank to us), knows his taps and gages. He measures their efficiency by the one standard of "*performance-ability*"... performance on the job and the cost records. That's why this experienced supervisor specifies —

Hanson-Whitney.....

The Hanson Process is the original method of *finishing after hardening*. Through this process, Hanson-Whitney has for 34 years produced a quality line of finished precision taps and gages to the complete satisfaction of our customers.

When threaded parts reach inspection, you will realize the value of "Co-ordinated Responsibility" that the Hanson Process contributes to the solution of your threading problems — the economical dependability of having one manufacturer furnish all of the production elements — precision machine tools, cutting tools and gages.

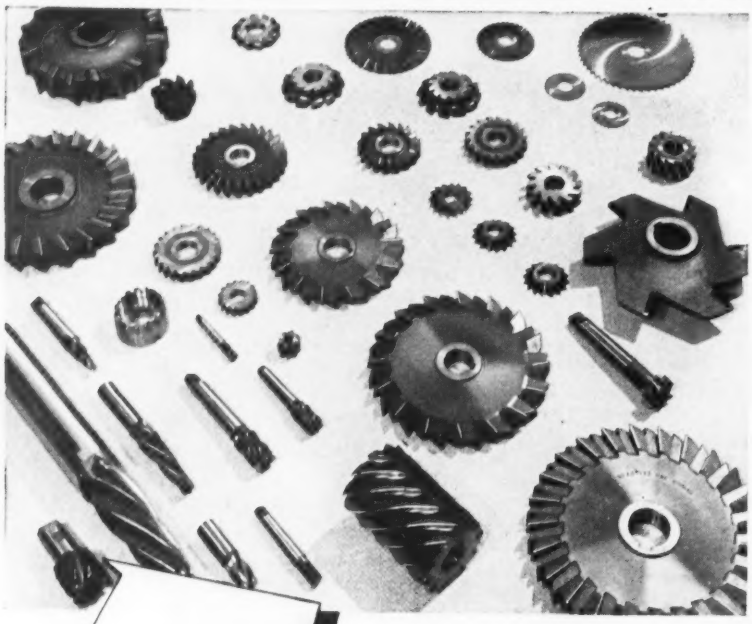
Yes, Mr. Franklin, the dependable, day-in, day-out performance of these Hanson-Whitney products is recorded on your cost sheets. Naturally, the right tap or gage for the specific job is essential. Ask the Hanson-Whitney representative for recommendations.

HANSON-WHITNEY DIVISION of the WHITNEY CHAIN CO.

160 Bartholomew Avenue, Hartford, Connecticut, U. S. A.

the **HANSON**
Threading Processes
Offer Complete
Coordinated
Responsibility
for
The Machine Tools
The Cutting Tools
The Measuring Gages

* Our "Mr. Franklin" is a composite character typical of the thousands of experienced practical machinists throughout the country. You, too, have a Mr. Franklin in your shop... ask him what he thinks about Hanson-Whitney products.



THE *Complete Line*

GORHAM

END MILLS AND MILLING CUTTERS







For profitable solutions to production milling problems, call on Gorham! Over thirty years' experience in creating fine cutting tools is your assurance of satisfaction.

An extensive line of *standard* end mills and milling cutters is stocked by Gorham distributors. When you need *special* tooling, a Gorham Field Engineer surveys your problem and makes design recommendations for a tool to be "tailor-made" for your application by skilled Gorham craftsmen.

Ask your distributor for Gorham "standards." For "specials," call in your nearby Gorham Field Engineer. They're both well qualified to help you . . . and backed by unmatched experience and facilities. For profitable solutions to milling problems, call on Gorham! There's no obligation.

Write for free 120 page catalog. Shows entire line, contains valuable engineering information.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

14405 WOODROW WILSON • DETROIT 3, MICHIGAN

WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

BOOKS, Technical

Industrial Press, 148 Lafayette St., New York 13, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

BORING AND DRILLING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Canedy-Otto Div. Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Wales-Strippit Corp., N. Tonawanda, N. Y.

BORING AND TURNING MILLS, Vertical

American Steel Foundries King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

BORING BARS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Erickson Tool Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Homestrand Inc., Larchmont, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lovejoy Tool Co., Inc., Springfield, Vt.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

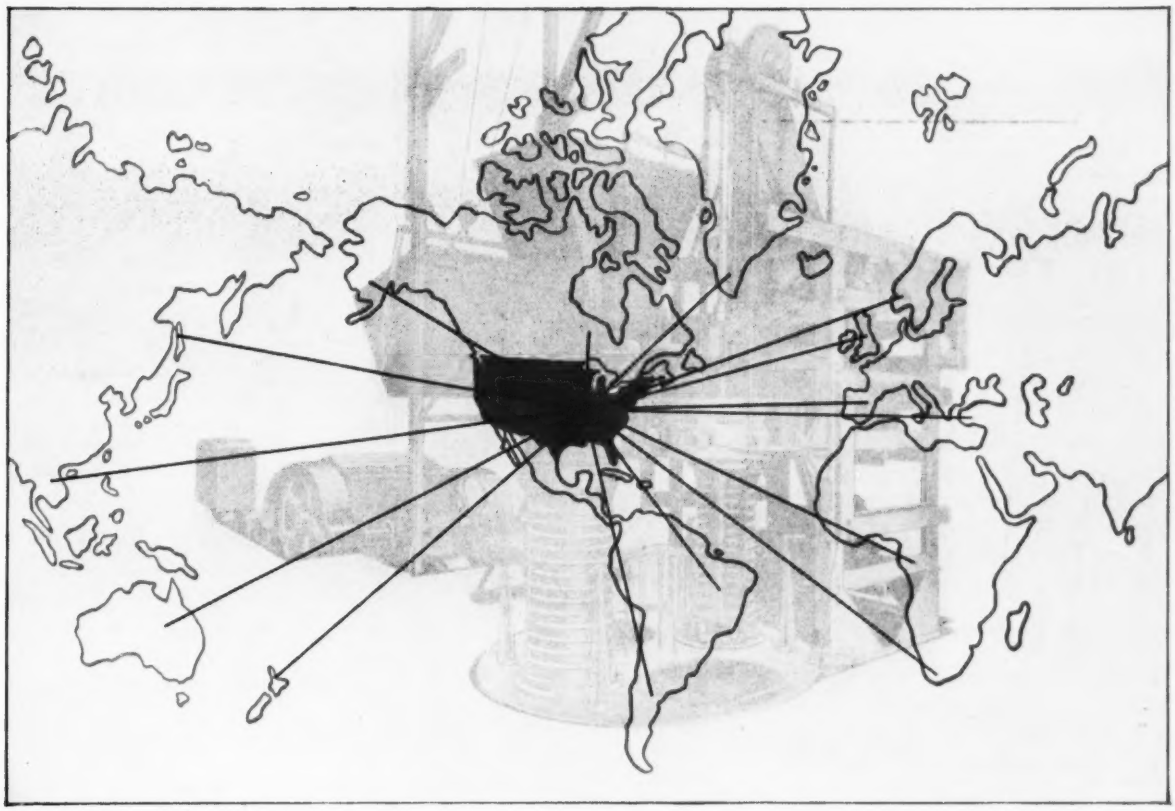
BORING, DRILLING AND MILLING MACHINES, Horizontal

(Floor, Planer or Table Types)

Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

(*Continued on page* 300)

For more information on products advertised, use Inquiry Card, page 247

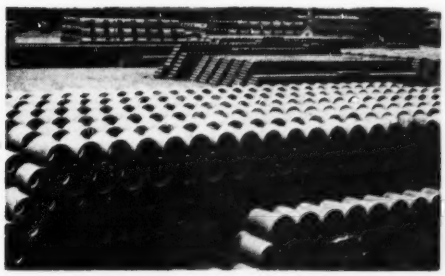


From Sioux City, Iowa:

CITIES SERVICE OILS AND GREASES SENT ALL OVER THE WORLD WITH McCRACKEN MACHINES!



"OUR FINISHED MACHINES are completely serviced with Pacemaker 2 hydraulic fluid, Optimus 4 oil in the transmission and Trojan M for bearing grease."



CORRUGATED CONCRETE PIPES, used for sewer, culvert and irrigation work, are one of industry's most vital tools. McCracken Machines make the very finest.

ONE CITIES SERVICE PRODUCT SOLD MANUFACTURER ON THE COMPLETE CITIES SERVICE QUALITY LINE!

During the early part of World War II, Concrete Pipe Machinery Co., manufacturers of McCracken Machines, called in a Cities Service Lubrication Engineer for answers to some tough metal-cutting problems. On his recommendation, they tried Cities Service Cutting Oil, Chillo 93. Finished work was so improved and tool life so prolonged, that Concrete Pipe had a complete lubrication survey made of their plant.

THIS CAREFUL SURVEY PROVED THAT THE COMPLETE CITIES SERVICE LINE COULD DO THE BEST JOB FOR THEM. Electric motors, spindles, gear reducers, air compressors . . . drilling, grinding, machining of cast iron parts, threading, tool and die work . . . hydraulic systems, bearings, transmissions . . . Cities Service Industrial Oils, Greases and Cutting Oils did better on every job! Concrete Pipe Machinery Co. says: "They are giving us outstanding service, and availability and delivery have always been excellent."

If you'd like to talk to a Cities Service Lubrication Engineer, write Cities Service Oil Company, Sixty Wall Tower, New York 5, New York, or call the office nearest you.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

For more information on products advertised, use Inquiry Card, page 247

You have precision

at your finger-tips

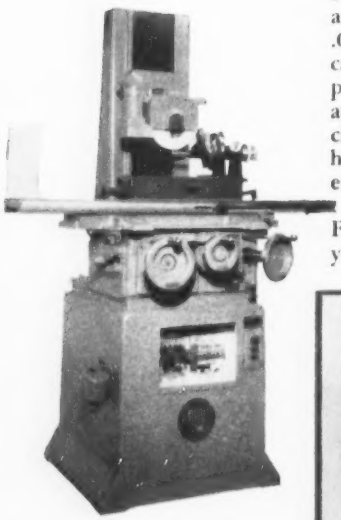


when you use REID GRINDERS

Every move counts, with no tiresome reaching or bending, when you operate a Reid. All controls are right at finger-tip level . . . always under your complete control, reacting instantly, without backlash or wheel play.

Such dependable performance, the result of Reid's built-in accuracy, insures precision to meet the closest tolerances. When the shop order reads .0001", put the work on a Reid and you can be sure that the finished piece will pass inspection. Reid Surface Grinders are designed and precision-built by specialists who put the results of over a half-century of experience into their every detail.

Find out the full story on Reid Features for Better Grinding: request your copy of Bulletin 618-2.



Elevating hand wheel, graduated in .0005"
Optional: Vernier, graduated in .0001", for elevating hand wheel
Cross feed hand wheel, graduated in .001"
Power feed (Model 618V), automatic adjustable cross feed from .006" to .100" at each reverse of table.
Table speed, 12-35 feet per minute
Work capacity: 6" x 18"
Table size: 51" x 8"
Standard wheel: 7" x ½" x 1¼"

Reid Brothers Company, Inc.

BEVERLY, MASSACHUSETTS

Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Mummert-Dixon Co., Hanover, Pa.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

Bryant Chucking Grinder Co., Springfield, Vt.
Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Simplex Machine Tool Corp., 4528 W. Mitchell St., Milwaukee, Wis.

BORING MACHINES, Jig

American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Wales-Strippit Corp., N. Tonawanda, N. Y.

BORING TOOLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Atrax Co., Newington, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit, Mich.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lovejoy Tool Co., Inc., Springfield, Vt.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.

(*Continued on page* 302)

For more information on products advertised, use Inquiry Card, page 247

any way you look at it . . .



portable grinding is profitable grinding with SIMONDS resinoid bonded grinding wheels



Spot grinding! Smoothing welds! Grinding in corners! Working with odd shapes! Wherever low-cost, top-operating efficiency is essential, Simonds portable wheels fill the bill. They cut fast, hold their shapes, give long service, and include everything you need—straight wheels, cup wheels, cones, pot-balls and blind-end wheels. Resinoid bonded for high speeds up to 9500 s.f.p.m. Write for free folder ESA-62.



Rotor type cup wheel—cross section shows steel bushing flange and safety ring.

SIMONDS ABRASIVE CO.
PHILADELPHIA 37, PA.

BRANCH WAREHOUSES: BOSTON, DETROIT, CHICAGO, PORTLAND, SAN FRANCISCO • DISTRIBUTORS IN PRINCIPAL CITIES

DIVISION OF SIMONDS SAW AND STEEL CO., FITCHBURG, MASS. • OTHER SIMONDS COMPANIES: SIMONDS STEEL MILLS, LOCKPORT, N.Y.; SIMONDS CANADA SAW CO., LTD., MONTREAL, QUEBEC AND SIMONDS CANADA ABRASIVE CO., LTD., ARVIDA, QUEBEC



Production More Than Doubled

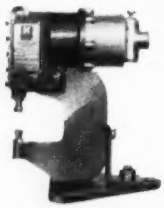
by changing to a

KELLER RIVETER

An electronic tube manufacturer boosted production from 62 to 155 pieces an hour by installing a Keller Compression Riveter in place of a kick press for staking the pins in vacuum tube bases. This 150% increase, achieved at relatively small cost, is typical of the results obtained by proper application of Keller Pneumatic Tools.

For riveting, staking, crimping, pressing, and marking operations, and for forcing fragile parts into a pressure fit, Keller Compression Riveters have the tremendous advantages characteristic of air power. They give a squeeze—not a slap—and exert maximum power only at the *end* of the stroke. This reduces shock and spoilage from cracked and broken parts.

Facts in Brief about **KELLER Compression Riveters**



- **Air pressure gives a squeeze—not a slap**
- **Can be operated by foot valve or hand throttle**
- **Automatic cycle, stops at end of each cycle**
- **Portable, bench, or pedestal mounting**
- **Ideal for pressing, dimpling, staking, forcing, or riveting operations**



Send for descriptive literature and detailed information

KELLER TOOL COMPANY

GRAND HAVEN, MICHIGAN

Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BRAKES, Press and Bending

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss, E. W., Co., 1375 Raff Road, S. W., Canton, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Columbia Machinery & Engrg. Corp., Hamilton 1, O.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Peck, Stow & Wilcox Co., Southington, Conn.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BROACHES

American Broach & Mch. Co., Ann Arbor, Mich.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Detroit Broach Co., 20201 Sherwood Ave., Detroit, Mich.
duMont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BROACHING MACHINES

American Broach & Mch. Co., Ann Arbor, Mich.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Foote-Burt Co., 130 St. Clair Ave., Cleveland 8, Ohio.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BRONZE

American Brass Co., Waterbury 20, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Johnson Bronze Co., New Castle, Pa.

BRUSHES, Industrial, Wire Wheel, Etc.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

BUFFERS

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md. (Portable Elec.).
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.

BULLDOZERS

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Atrax Co., Newington, Conn.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

(*Continued on page* 304)

For more information on products advertised, use Inquiry Card, page 247

Simplified Valving and Electrical Controls

All valves are mounted on a single manifold to simplify piping and maintenance—as J.I.C. suggests. Electrical controls also meet J.I.C. recommendations.

Floor Space Saved

By mounting the power unit and reservoir at the top of press, valuable floor space was saved...yet the entire unit is readily accessible for maintenance.

Hannifin press Solves Customer's Problem



Stroke	24″
Daylight	40″
Table Width (between columns)	60″
Table Depth	48″
Approach	67″/min.
Feed	11″/min.
Return	114″/min.

Versatile, Movable Operating Controls

Exclusive Hannifin Sensitive Pressure Control for hand or foot operation—so arranged that the operating levers can be positioned anywhere along front of press, depending upon nature of work.

Basically this is a standard 150-ton, 4-column Straightening Press...yet it is an example of modifications available at Hannifin to meet customer needs.

For example: Because his floor space was limited, the hydraulic power unit is mounted on top of the press. The table top is "tailored" to the 24-inch height of other units in his production line. The control levers, for hand or foot operation, are movable across the entire front of the press. Both hydraulic and electrical specifications meet J. I. C. recommendations.

Quite probably you can select the hydraulic press you need directly from the complete Hannifin Catalog that includes more than 75 standard models in 1 to 150-ton capacities...but, if your requirements are special, a Hannifin Field Engineer will help you specify a press that will exactly solve your problem.

Hannifin Corporation, 1109 South Kilbourn Avenue, Chicago 24, Illinois

Hannifin Representatives Are at Your Service in These Leading Industrial Centers

Atlanta, Buffalo, Cincinnati, Cleveland, Dallas, Dayton, Denver, Detroit, Houston, Los Angeles, Milwaukee, Minneapolis, Moline, New Orleans, New York, Philadelphia, Pittsburgh; Richmond, Va.; Rochester, N. Y.; St. Louis; Seattle; South Bend, Ind.; Washington, D. C.; Worcester, Mass. In Canada: TEM Sales Company Limited, Toronto and Windsor.

HANNIFIN

Hydraulic Presses • Pneumatic Presses • Hydraulic Riveters
Hydraulic Cylinders • Air Cylinders • Air Control Valves

WRITE FOR BULLETIN 130

HANNIFIN CORPORATION
1109 S. Kilbourn Ave., Chicago 24, Illinois
Please send Bulletin 130 on Hannifin Hydraulic Presses.



Name.....

Position.....

Company.....

Address.....

City.....*State*.....

For more information on products advertised, use Inquiry Card, page 247



MODEL J
(Wet or Dry)
10" x 18" Capacity

Check its

✓ CAPACITY
✓ STRENGTH
✓ 3-Point Suspension
✓ Safety
✓ Centralized CONTROL

and You'll buy a

JOHNSON BAND SAW

MODEL B
5" x 10" Capacity
Light—Portable



WRITE FOR DETAILS

JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

Chambersburg Engrg. Co., Chambersburg, Pa.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BURS

See Files and Burs, Rotary

BUSHINGS, Brass, Bronze, Carbide, Etc.

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Johnson Bronze Co., New Castle, Pa.
Kennametal, Inc., Latrobe, Pa.

BUSHINGS, Hardened

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
U. S. Steel Co., Inc., 436 7th Ave., Ptitsburgh, Pa.
U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

BUSHINGS, Jig

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Tool

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

CALIPERS

Ames, B. C., & Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

CAM CUTTING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CAM MILLING AND GRINDING MACHINES

Hirschmann, Carl, Co., 30 Park Ave., Manhassett, N. Y.
Landis Tool Co., Waynesboro, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rowbottom Machine Co., Waterbury, Conn.

CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Kux Mch. Co., 3930-44 W. Harrison St., Chicago, Ill.
Rowbottom Machine Co., Waterbury, Conn.

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wesson Metal Corp., Lexington, Ky.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

(*Continued on page* 306)

For more information on products advertised, use Inquiry Card, page 247

At Kaydon ENGINEERING CORPORATION:

Maintenance Costs on KING

VERTICAL BORING & TURNING MACHINES

Less than $25 a year PER MACHINE!



Photo courtesy of American Machinist.

A 65¼" dia. Bearing Ring is shown being machined on a 72" KING Vertical Boring & Turning Machine at The Kaydon Engineering Corp. Accurate machining of these large diameter, thin sections is essential, since machining distortion cannot be removed by heat-treating.

The Kaydon Engineering Corporation, Muskegon, Michigan, manufactures a complete line of high precision ball and roller bearing assemblies, with rings of 4" bore to 120" OD. An essential part of Kaydon's distortion control methods for manufacturing these large diameter bearing rings having thin sections—often under ½" at the raceway—is *accurate* machining of the ring OD, face, and groove on KING® Vertical Boring & Turning Machines. (See photo above.)

Mr. Maurice Jensen, General Superintendent of the Kaydon Engineering Corporation, makes the following statement concerning his experience with KING machines: "Three 72" Kings have been in operation for about two years, 24 hours a day, five days or more per week, and our total maintenance cost for the three machines has been less than $25 a year per machine. One 72" King has been in operation for ten years with less than $50 yearly maintenance cost over this period."

Mr. Jensen further states, "It is possible to consistently produce pieces from these machines with a maximum eccentricity of .001. For high production runs and machining approximately .100 for a finish cut, we have successfully maintained a .005 tolerance, and we have found that the dial readings will repeat and give us a maximum variation of .003 to .005."

Here again is on-the-job evidence of typical KING performance . . . and why KING is industry's *first choice for accurate, economical work.* KING machines are made in 10 sizes, 30" to 144", in a variety of head combinations. Look into their advantages for *your* production.

American Steel Foundries

KING MACHINE TOOL DIVISION

1150 TENNESSEE AVENUE CINCINNATI 29, OHIO

GET MORE PARTS

Per Day... Per Die... Per Dollar!

with . . .

Startling production results — and savings — are guaranteed by B. Jahn dies because each is engineered with ingenuity and craftsmanship that pays off throughout prolonged die life . . . designed for *performance and performance alone* . . . "production proved" to work — and keep on working — in the customer's equipment to his complete satisfaction.

PRODUCTION B. Jahn PROVED

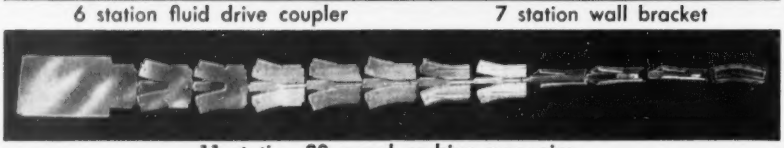
DIES



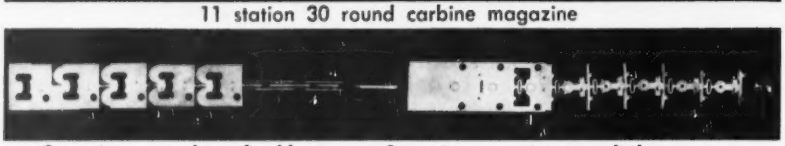
11 station toe plate for ice skate



6 station fluid drive coupler — 7 station wall bracket



11 station 30 round carbine magazine



8 station parachute buckle — 9 station car cigarette lighter part

ACTUAL CASE HISTORIES DEMONSTRATE HOW B. JAHN DIES BREAK PRODUCTION RECORDS . . . DELIVER MORE PARTS PER DAY, PER DIE, PER DOLLAR!



Send today for the fact-packed, picture story of "B. Jahn Production Proved Dies."

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

CASEHARDENING FURNACES
See Furnaces, Heat-Treating

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.
Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

CASTINGS, Die
Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
American Brass Co., Waterbury 20, Conn.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Madison-Kipp Corp., Madison, Wis.

CASTINGS, IRON
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engineering Co., Chambersburg, Pa.
Hansell-Elcock Co., 485 W. 23rd Place, Chicago 16, Ill.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.

CASTINGS, Steel, Alloys, Etc.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Lebanon Steel Foundry, Dept. J, Lebanon, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

CENTERING MACHINES
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CENTERS, Lathe
Adams Carbide Corp., 999 South 4th St., Harrison, N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(*Continued on page* 308)

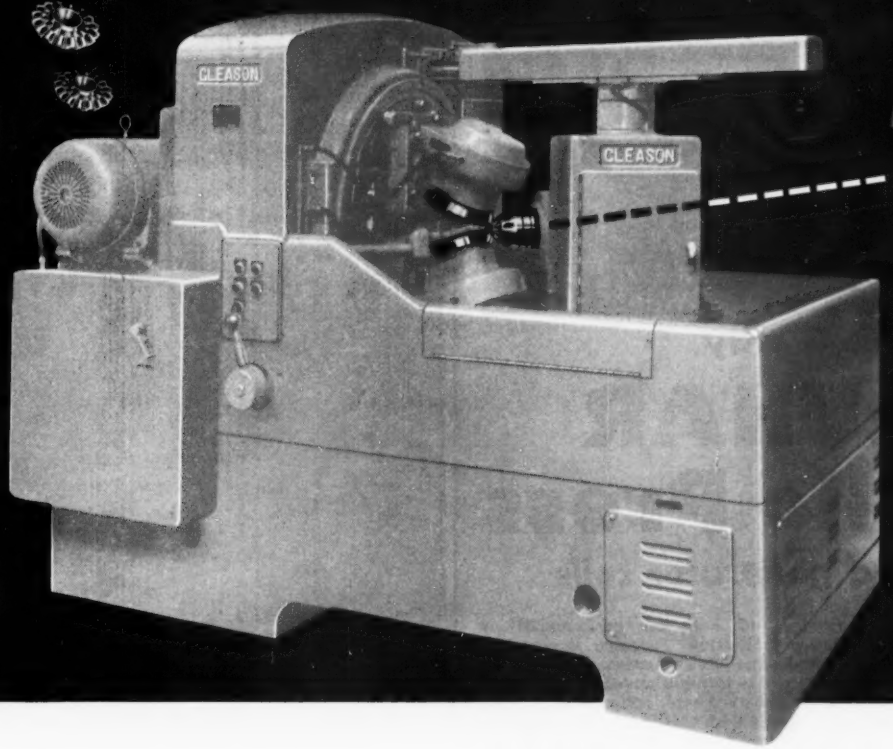
For more information on products advertised, use Inquiry Card, page 247

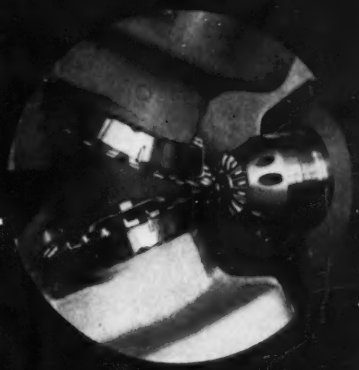


for the first time . . .

CONIFLEX Gears

in one operation !





INTERLOCKING
DISC-TYPE CUTTERS
Provide
Continuous Cutting Action
FINER FINISH
MORE PRODUCTION
LESS DOWN TIME
FOR SHARPENING

COMPLETE ACCESSORY EQUIPMENT

No. 104 Cutter Sharpener: Fully automatic wet grinding—angles easily set and maintained—simplified set-up and changeover.

No. 13 Tester: Practical running check provides precise testing over a wide range of gear specifications. Brake load and multi-speed drive simulate actual operating conditions.

No. 104 Straight Bevel CONIFLEX® Generator

***FROM 16 DP TO 3 DP, 8½" DIAMETER, 1⅜" FACE**

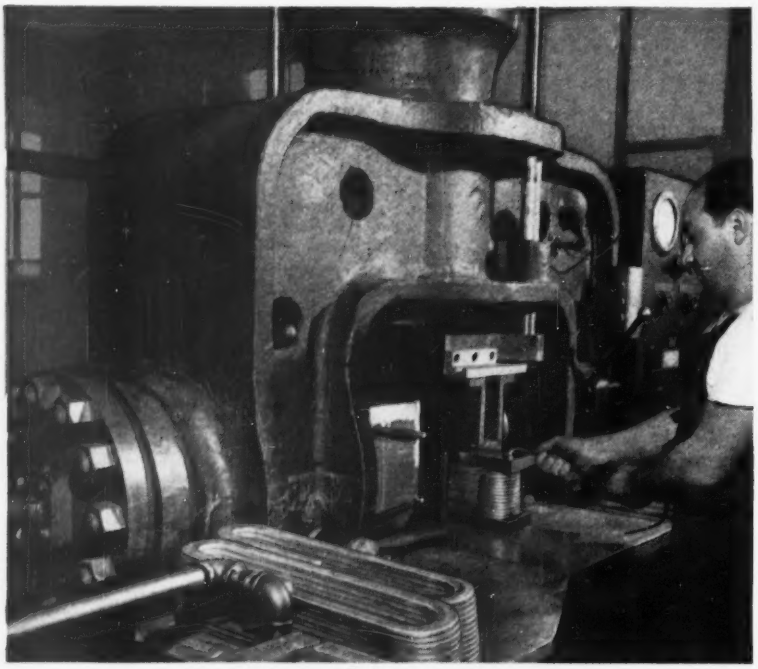
Newly developed to generate better bevel gears and pinions *faster* at lower cost. Cuts many sizes with minimum set-up time, few cutters. Cam-actuated generating roll insures maximum efficiency in the cutting cycle. Ideal for volume or short-run production.

BULLETINS ON REQUEST

For all bevel gear design and production problems, Gleason Engineering Service is available throughout the world. Please submit prints and complete data.

GLEASON WORKS

BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS
1000 UNIVERSITY AVE. • ROCHESTER 3, NEW YORK



How this 2-way

FARQUHAR Hydraulic Press

forms motor and generator coils

In producing motor and generator coils from ¼ x 1-in. copper stock, the stock is first bent and the ends laminated, and then pressed to restore them to their original thickness. Then, the coil is put in this Farquhar 2-way Hydraulic Press for "pressing" the form.

The coil is laid on a steel block, a three-part filler mandrel inserted, and a top block applied. The press "snugs" the coil sides at low pressure (40 tons); then the vertical ram snugs the top. The operator kicks the pressure-shift pedal, to double vertical-ram pressure for forming.

Capacities of rams are 100 tons horizontally and 200 tons vertically. Illustration above shows operator withdrawing the coil after forming has been completed.

Farquhar Presses Cut Your Costs

The above installation is just one more example of Farquhar performance in heavy production! Farquhar Presses are built-for-the-job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of the extra guides on the moving platen . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

Farquhar engineers are ready to help solve whatever production problem you may have. Their expert assistance is yours for the asking. Give them a call . . . at no obligation, of course!

Or, send for our free catalog showing Farquhar Hydraulic Presses in all sizes and capacities for all types of industry. Write to: THE OLIVER CORPORATION, A. B. Farquhar Division, *Hydraulic Press Dept.*, 1504 Duke St., York, Pa.

Farquhar

HYDRAULIC PRESSES

for Bending • Forming • Forging • Straightening • Assembling • Drawing
Extruding • Jogging • Forging • and other Metalworking Operations

THE OLIVER CORPORATION • A. B. FARQUHAR DIVISION

CHAINS, Power Transmission and Conveyor

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Thor Power Tool Co., Aurora, Ill.

CHUCKING MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co. (Multiple Spindle), 170 E 131st St., Cleveland, Ohio.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Sundstrand Mch. Tool Co., 2531 11th St Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave. Cleveland 3, Ohio.

CHUCKS, Air Operated

Cushman Chuck Co., Windsor Ave., Hartford 2 Conn.
Gisholt Machine Co., 1245 E. Washington Ave Madison 10, Wis.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Schrader's Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Whiton Machine Co., 190 Howard St., New London, Conn.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets

CHUCKS, Diaphragm

Gleason Works, 1000 University Ave., Rochester, N. Y.
Van Norman Co., 2640 Main St., Springfield 7, Mass.

CHUCKS, Drill

Erickson Tool Co., 2309 Hamilton, Cleveland, Ohio
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Supreme Products, Inc., 2222 So. Calumet, Chicago 16, Ill.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

CHUCKS, Full Floating

Erickson Tool Co., 2309 Hamilton, Cleveland, Ohio
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

(*Continued on page* 310)

For more information on products advertised, use Inquiry Card, page 247

SAVING MONEY BY *Forging*

A 3590 POUND THROTTLE VALVE BODY

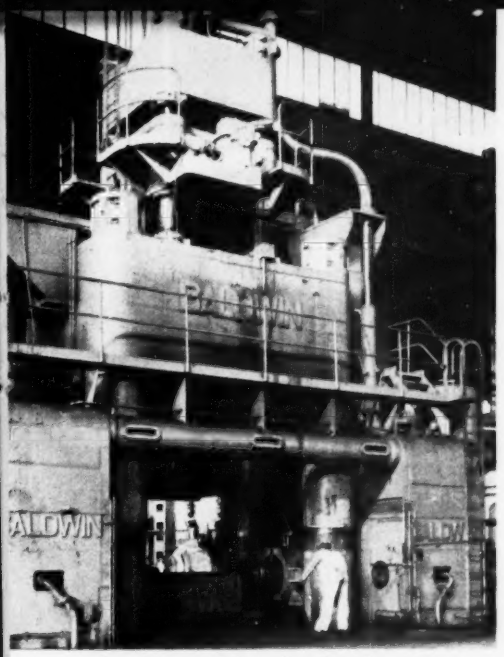
A large size and intricate shape has been forged at Cameron. The result—homogeneous shapes, controlled grain flow and less machining time. Truly a new era in steel forging.

For further information write

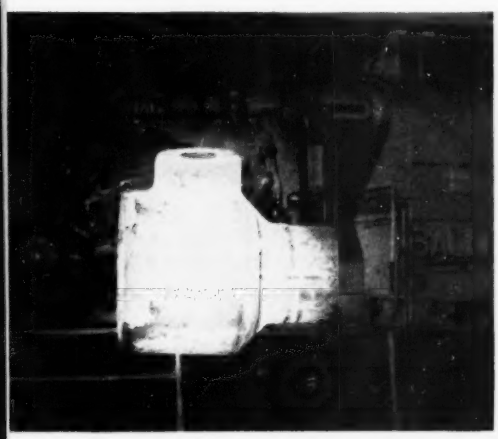
FORGE AND ORDNANCE DIVISION

Cameron

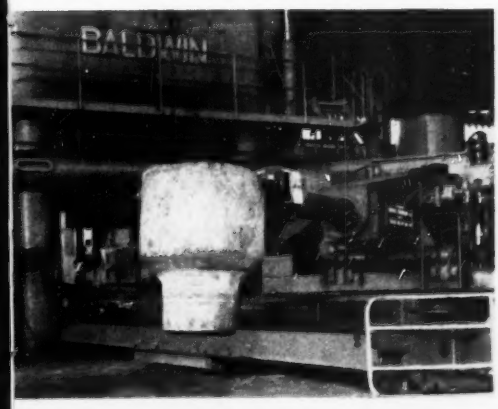
IRON WORKS, INC.
HOUSTON, TEXAS



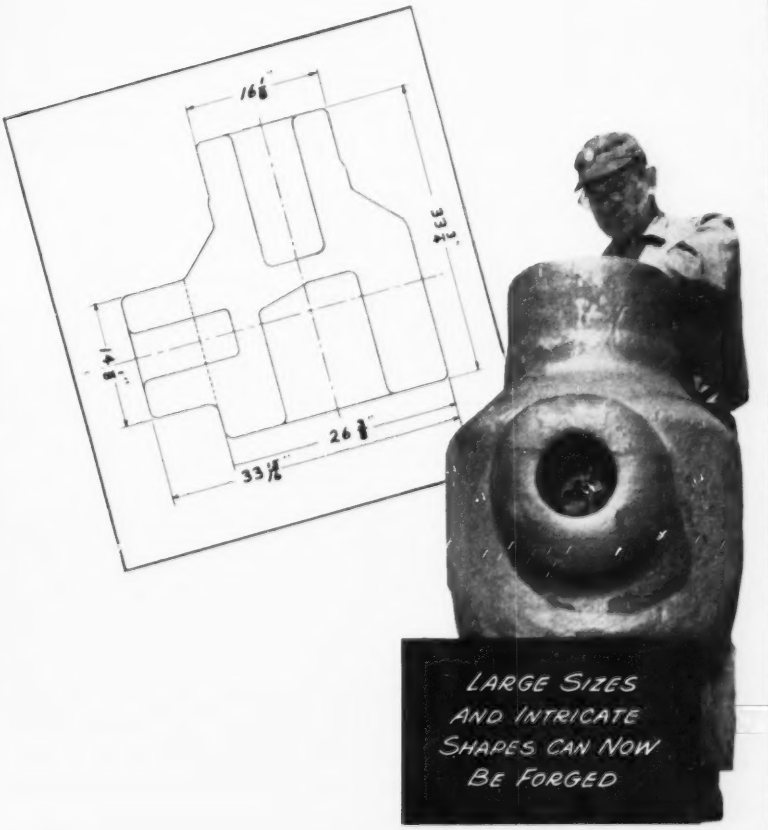
The horizontal split die has just opened after forging a throttle valve body.



The throttle valve body, having been pierced by the two side acting rams and the down acting ram, is removed from the die set.



The manipulator is placing the 3,590 pound forging to one side for further processing.



Large Sizes And Intricate Shapes Can Now Be Forged

THEY HAVEN'T A FRIEND IN THE WORLD!

AMES



...the preferred

Ames Long Range Dial Indicator No. 262

... not because they cost more (in the long run they're more economical) but because they're completely *impersonal.* They do their measuring jobs absolutely independent of the human hand.

For more than 50 years, Ames Micrometer Dial Gauges and Indicators have kept pace with increasingly critical precision requirements. Today, each part of every Ames product is carefully built by exclusive Ames methods and machines from the materials best suited to its function – and 100% checked for accuracy. As a result, all Ames products are extremely accurate and sensitive, yet rugged and tough – to give you *longer* service with *less* down-time.



Ames Dial Comparator No. 13

Ames Dial Micrometer No. 502

Ames Caliper Gauge No. 12B

Ames Trutest Indicator Sets

Send today for your free copy of Catalog No. 58

Representatives in principal cities B. C. AMES CO. *27 Ames Street Waltham 54, Mass.*

Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

CHUCKS, Gear

Gleason Works, 1000 University Ave., Rochester, N. Y.
Horton, E., & Son Co., Windsor Locks, Conn.
Supreme Products, Inc., 2222 So. Calumet, Chicago 16, Ill.

CHUCKS, Lathes, Etc.

Buck Tool Co., 220 Schippers La., Kalamazoo, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Erickson Tool Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Horton, E., & Son Co., Windsor Locks, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Whiton Machine Co., 190 Howard St., New London, Conn.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety

Clarkson, Inc., 320 Ontario St., Toledo, O.
Erickson Tool Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jarvis, Charles L., Co., Middletown, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel

Gardner Mch. Co., Div. Landis Tool Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

CLAMPING APPLIANCES FOR MACHINE TOOLS

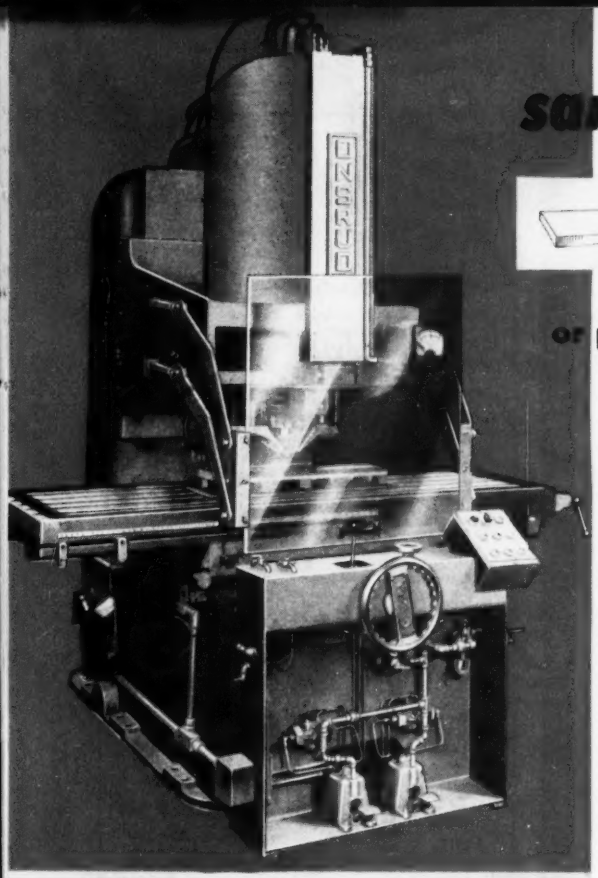
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit, Mich.

CLAMPS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.

(*Continued on page* 312)

For more information on products advertised, use Inquiry Card, page 247



same high speed feeds



in straight line

or profiles



with

Onsrud®

InvOmil (TM)

Profile Milling Machines

for aluminum and similar non-ferrous metals

Spindle speeds of 7,200 to 14,400 RPM plus electronic coordination of feeds, give production speeds unequalled in aluminum profile milling. Whatever the curve or contour, cutter head and table feeds remain constant without slow down or stopping, even for a 90° corner! Follower of cutter head travels along template, for precision duplication of contour on work. Patented Onsrud Coordinated Feed design, combines table longitudinal and transverse feeds with rotary InvOmil head feed into one electronically synchronized feed system...easily controlled by operator. Your inquiry is invited.

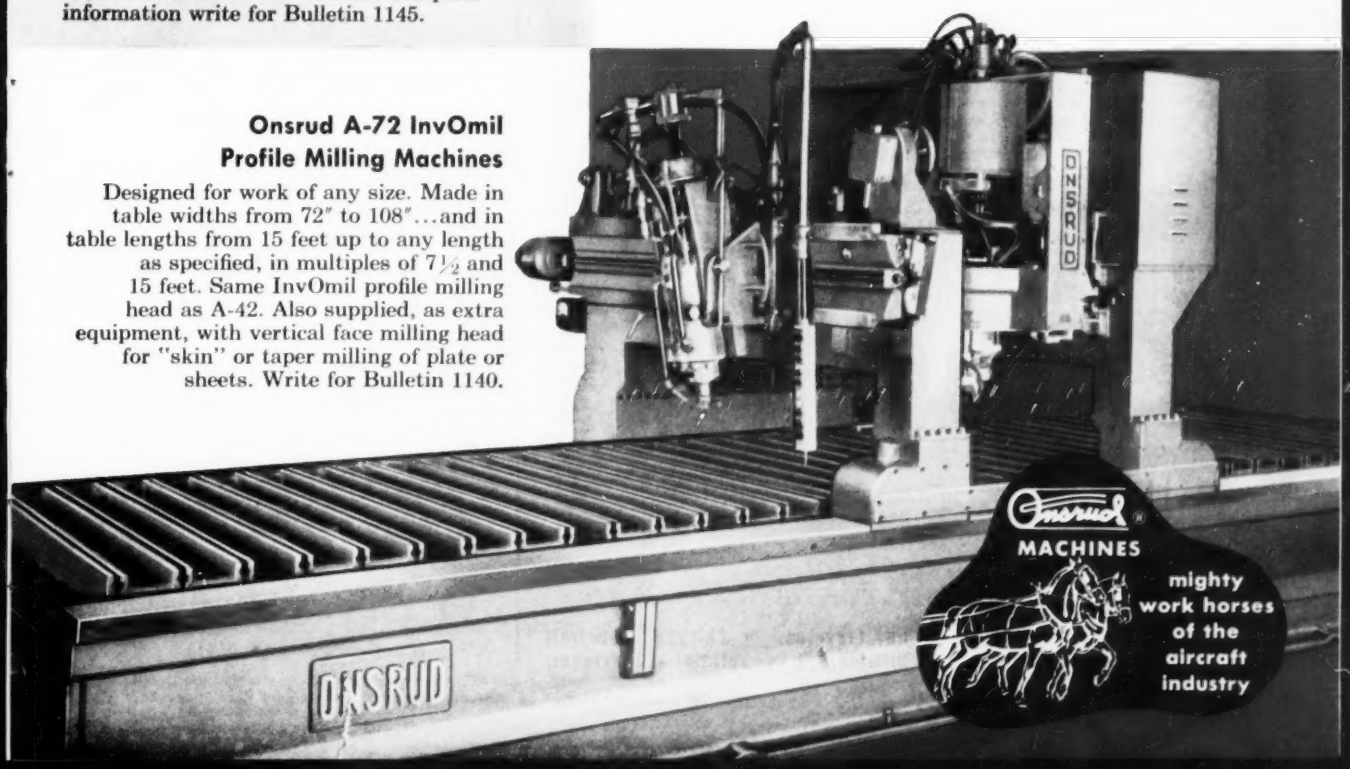
ONSRUD MACHINE WORKS, INC.
3940 Palmer Street • Chicago 47, Illinois

Onsrud A-42 InvOmil Profile Milling Machines

Supplied with 80″ or 98″ tables for longitudinal feeds of up to 42″ and 60″ maximum. Transverse feed up to 12″. Ruggedly built machine for heavy duty profile milling of aluminum plate, sheets, forgings, castings or formed parts. Direct cutter drive by Onsrud air cooled, two-speed 7,200/14,000 RPM, 15/30 HP induction motor. For complete information write for Bulletin 1145.

Onsrud A-72 InvOmil Profile Milling Machines

Designed for work of any size. Made in table widths from 72″ to 108″...and in table lengths from 15 feet up to any length as specified, in multiples of 7½ and 15 feet. Same InvOmil profile milling head as A-42. Also supplied, as extra equipment, with vertical face milling head for "skin" or taper milling of plate or sheets. Write for Bulletin 1140.



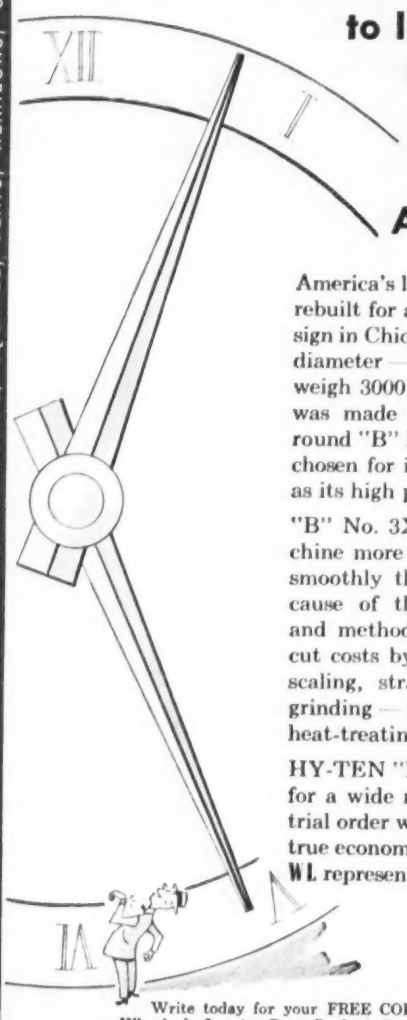
OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS

it's the right time

to Investigate the Qualities of

HY-TEN

ALLOY STEEL



America's largest clock was recently rebuilt for a spectacular illuminated sign in Chicago. It measures 50 ft. in diameter — hands and movement weigh 3000 lbs. The new driveshaft was made from 6 ft. of 3½-inch round "B" No. 3X heat-treated bar, chosen for its machinability as well as its high physical properties.

"B" No. 3X heat-treated bars machine more readily and finish more smoothly than standard alloys because of their particular analysis and method of manufacture. They cut costs by eliminating distortion, scaling, straightening — and often grinding — as well as the cost of heat-treating finished parts.

HY-TEN "B" No. 3X bars are used for a wide range of applications. A trial order will convince you of their true economy. Just call your nearest WL representative.



Write today for your FREE COPY of the Wheelock, Lovejoy Data Book, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS

WHEELOCK, LOVEJOY & COMPANY, INC.

Warehouse Service

CAMBRIDGE • CLEVELAND
CHICAGO • HILLSIDE, N. J.
DETROIT • BUFFALO
CINCINNATI

In Canada
SANDERSON-NEWBOULD, LTD., MONTREAL

HY-TEN and AISI

138 Sidney St., Cambridge 39, Mass. and Cleveland • Chicago • Detroit Hillside, N. J. • Buffalo • Cincinnati

Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Starrett, The L. S., Co., Athol, Mass.
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

CLEANERS, Chemical, for Metal

Bullard Co. Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

CLUTCHES

Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Formsprag Co., 23609 Hoover Rd, Van Dyke, Mich.
Link-Belt Co., 300 West Pershing Rd., Chicago 9, Ill.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

COLLARS, Safety

Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS

Brown & Sharpe Mfg. Co., Providence, R. I.
Erickson Tool Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS, Optical

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Eastman Kodak Co., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York.

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lopping)
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Shear-Speed Chem. Prod. Div., Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

(*Continued on page* 314)

For more information on products advertised, use Inquiry Card, page 247

POP'S school of Filing



Too many files go to an early grave (scrap barrel) because of incorrect use and lack of care. Nicholson—world's foremost file manufacturer—goes to extraordinary lengths to put extra quality and life into Nicholson and Black Diamond files in order to give industrial concerns an extra measure of filing production. Getting it is well worth keeping workers reminded of these simple rules:

DON'T put too much pressure on forward file stroke.

DON'T drag file back under needless pressure.

DON'T let files become clogged with dirt or filings.

DO "tap" file frequently (on wood) to loosen chips; also clean with file brush or "card."

DON'T throw files on top of one another. (Scuffs, blunts and chips teeth.)

DO keep files separated (in racks).

DON'T let files rust. (Corrodes and dulls teeth.)

DO use *The right file for the job.**

***CONSULT YOUR INDUSTRIAL DISTRIBUTOR.** The variety of Nicholson and Black Diamond files is wide. Designs are frequently distinctive. The importance of careful selection is great. No other file manufacturer has gone more intimately into the solving of industrial filing problems—in relation to different metals, operations and shop practices. We, through Industrial Distributors and our own field services, will help you gladly.

"FILE FILOSOPHY," Nicholson's famous book on the kinds, use and care of files, is FREE for use in "shop schools," tool rooms, production studies, etc. How many copies can you use?

NICHOLSON FILE CO. • 18 ACORN ST. • PROVIDENCE 1, RHODE ISLAND

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON ... A FILE FOR EVERY PURPOSE

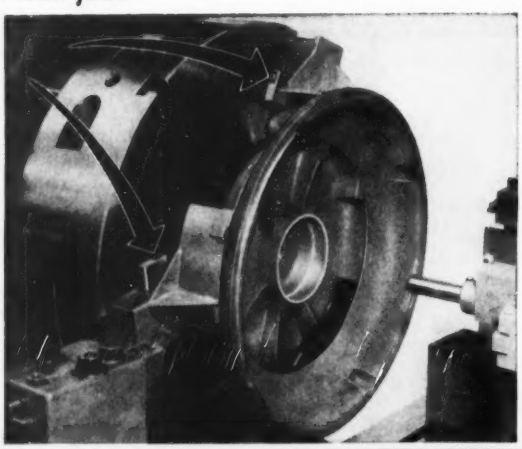


for precision adjustment of lathe chucks

Designed for easy installation on any top jaw used on an American Standard Serrated Jaw Chuck. Top jaws are then interchangeable on any chuck of American Standard Serrated type. Precision adjustment is made by using the hex wrench furnished with the Jaw-Set. Only one screw is required to control microadjustment.

The rigidity of a non-adjustable chuck plus complete precision adjustment of each jaw!

The Potter and Johnson Co., of Pawtucket, R. I. was the first machine tool builder to recognize the advantages of the Whiton Micro Jaw-Set used in combination with Whiton Air Chucks. This 24" Whiton Air Chuck is mounted on a 6D Potter & Johnson Automatic Turret Lathe tooled for quantity production of motor end shields. The operator can make microadjustment of any jaw with the Jaw-Set. Jaws can be set precisely concentric for second operation work.



Whiton SINCE 1856

COMPOUNDS, Resin and Molding

Bakelite Co., Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden, Ave., Syracuse, N. Y.
Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Fellows Gear Shaper Co., Springfield, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 250 Kishwaukee St., Rockford, Ill.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

CONTROLLERS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

CONTROLS, THERMO

Control Products, Inc., 306 Sussex St., Harrison, N. J.

CONVEYORS FOR DUST, CHIPS, ETC.

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9.

COOLANT COOLERS

Frostrode Div. Viking Products, 3066 East Outer Dr., Detroit 34, Mich.

COOLANT SEPARATORS

See Separators, Oil or Coolant.

COUNTERBORES

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Besly-Welles Corp., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

(Continued on page 316)

For more information on products advertised, use Inquiry Card, page 247

MOREY offers

DAVID BROWN

Outstanding

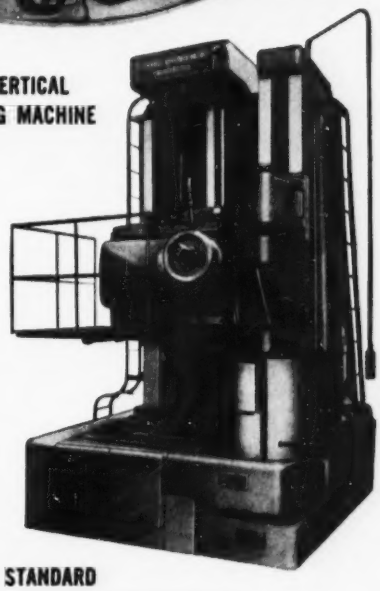
GEAR & SPLINE HOBBING MACHINES

- Highest degree of maintained accuracy
- Extreme rigidity under production stress
- Maximum productivity
- Economy of operation

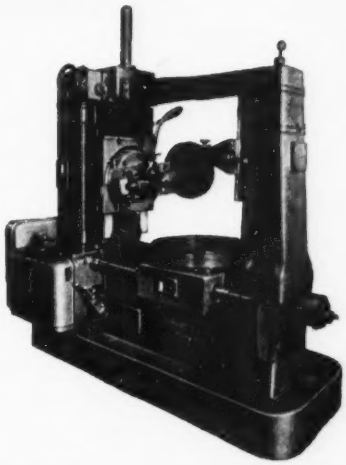
PROMPT DELIVERY



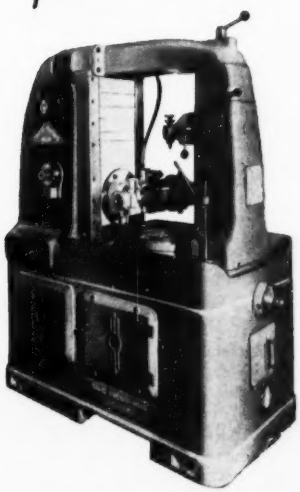
GEAR HOBBING MACHINE
Model MH
75-100-150-200



24 and 36 VERTICAL
PINION HOBBING MACHINE



STANDARD
GEAR HOBBING MACHINE
Model MT 30



STANDARD GEAR HOBBING MACHINE
Model MT 15

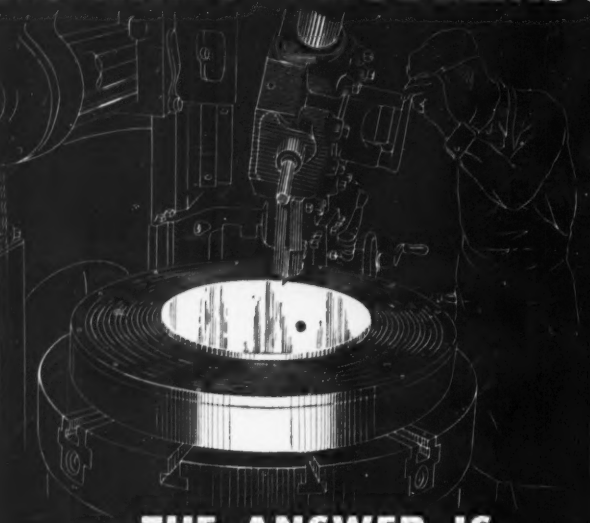
The David Brown range of machine tools for the production of gears, splines, serrations and sprockets includes Moving Table Hobbing Machines up to 60″ dia., Moving Head Hobbing Machines up to 200″ dia., Spline Shaft Hobbing Machines up to 35″ between centers, Testing and Crossed Axis Gear Shaving Machines up to 200″ dia.

For full details and specifications on any of these machines, write, wire or phone today!

MOREY ...for machine tools!

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
410 BROOME STREET • NEW YORK 13, N. Y.
CANAL 6-7400 • CABLE ADDRESS: WOODWORK, N. Y.

CHUCKING PROBLEMS?



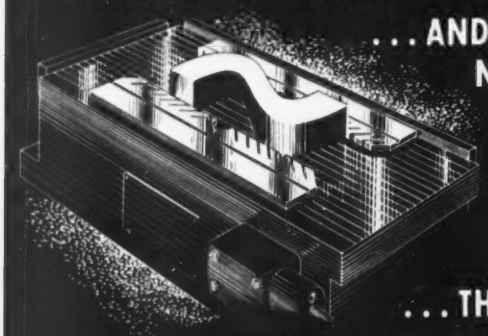
...THE ANSWER IS

Magna-Lock electro-magnetic CHUCKS



Get details . . . WRITE DEPT. M-14

Rectangular . . . rotary . . . swiveling. Wide range of sizes and voltages. 22% more magnetic area . . . pieces held to extreme edges of chuck. Moisture-proof. Exclusive all-steel construction. Many other advantages.



...AND FOR HOLDING NON-MAGNETIC MATERIALS ON MAGNETIC CHUCKS

...THE ANSWER IS

*patented

Magna-Vise*

Magna-Lock is first to increase your machine's productivity

Hanchett MAGNA-LOCK CORPORATION

Magna-Lock

Magnetic Chucks and Devices

BIG RAPIDS, MICHIGAN, U. S. A.

Standard Tool Co., 3950 Chester Ave., Cleveland Ohio
Starrett, The L. S. Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Peck, Stow & Wilcox Co., Southington, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.

COUNTERS, Revolution

Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S. Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUPLINGS, Flexible

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg Co., Wickliffe, Ohio.
Morgan Engrg Co., Alliance, Ohio.

CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

CUTTERS, Gear

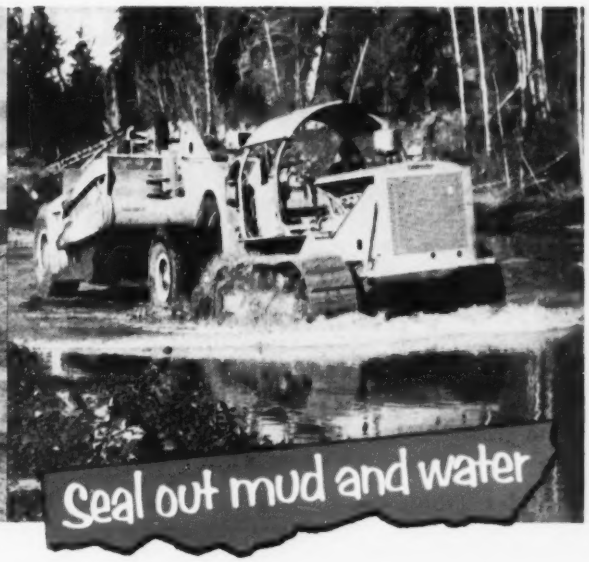
Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.

(*Continued on page* 318)

For more information on products advertised, use Inquiry Card, page 247

For TOUGH Sealing Jobs use American Felt!







Installing a dust seal gasket between the castings in the bevel gear and steering clutch compartment of a Caterpillar track-type Tractor.

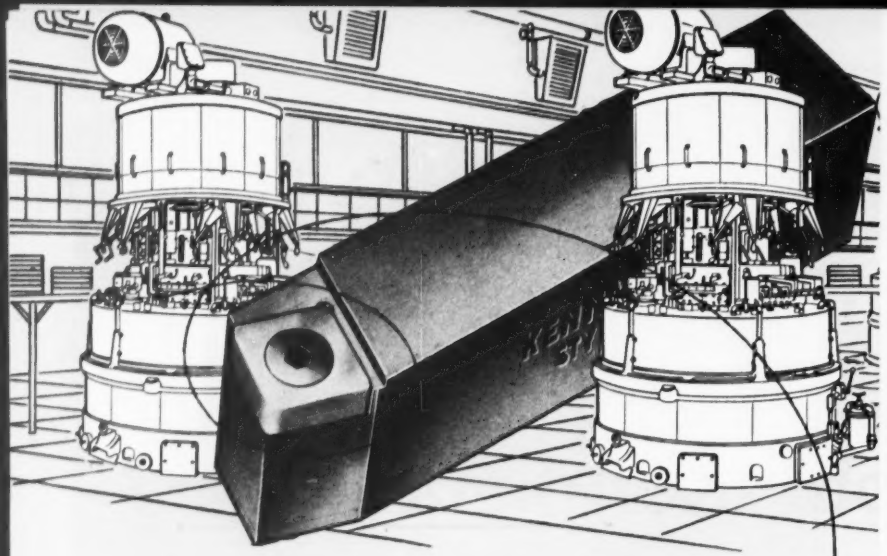
Probably tractors encounter more severe operating conditions than almost any other piece of mechanical equipment, and for that reason it is vitally important to keep dust, grit, and water out of operating parts, and oil and grease in. Felt seals are ideal for this purpose, and American is proud to supply felt for sealing to Caterpillar Tractor Co., Peoria, Illinois. In these days of expanding construction, you will see Caterpillar-built machinery everywhere. Felt is in many of them, unseen, helping protect performance, reliability, and long life . . . American makes various types of felt for sealing purposes, and supplies it as desired, including gaskets and washers cut to size. For information, write for Data Sheet No. 11, "Felt Seals, Their Design and Application."

American Felt Company
TRADE MARK

GENERAL OFFICES: 68 GLENVILLE ROAD, GLENVILLE, CONN.

SALES OFFICES: New York, Boston, Chicago, Detroit, Cleveland, Rochester, Philadelphia, St. Louis, Atlanta, Dallas, San Francisco, Los Angeles, Portland, Seattle, San Diego, Montreal.—PLANTS: Glenville, Conn.; Franklin, Mass.; Newburgh, N. Y.; Detroit, Mich.; Westerly, R. I.—ENGINEERING AND RESEARCH LABORATORIES: Glenville, Conn.

For more information on products advertised, use Inquiry Card, page 247



The Most Critical Point in AUTOMATION

Machine shop automation—the new trend toward automatic conveying, loading, cutting, unloading, and transferring of workpieces—promises great gains in productivity, but it must have cutting tools designed for the operation.

Two features are essential in cutting tools for automation: (1)Durability which enables operation to be sustained with minimum stoppage for tool changing, and, (2)precision-ground, pre-set, multiple-edge tools which permit quick changing when necessary.

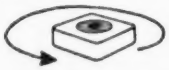
Kendex "throw-away" inserts —an exclusive Kennametal development—have both features. Made of Kennametal, they have its high hardness and wear-resistant properties for great durability. Screw-mounted, they can be quickly rotated, in seconds, to new cutting positions. No grinding is required—the insert is thrown away after all cutting edges have been used and quickly replaced with a new preground "button" ... round, square, or triangular as required.

Our engineers, in on the ground floor of automation, have cooperated in developing and applying Kendex, Kennamatic,* and other types of Kennametal tooling to its requirements. The features of this tooling may be the solution to reducing machining and tool maintenance costs—on any operation—in your shop. Ask your Kennametal tool engineer how you may apply it to advantage. Kennametal Inc., Latrobe, Pa.

KENDEX* tooling keeps AUTOMATION IN ACTION!



1. Hard, strong, wear-resistant Kennametal is molded into square, round, or triangular Kendex inserts, which are precision ground.



2. Kendex inserts are mounted to suitable holder with socket head screws. When edge becomes dull, insert can be turned, in seconds, to new cutting position.

- *MINIMIZE* downtime for tool changing—a major cause of unprofitable operation.
- *ELIMINATE* tool grinding expense—Kendex inserts are not ground; simply thrown away when all cutting edges have been used.

*Registered Trade-Marks

KENNAMETAL

CEMENTED CARBIDE TOOLING THAT INCREASES PRODUCTIVITY

SALES OFFICES IN PRINCIPAL CITIES



A-5

Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Michigan Tool Co., 7171 E. McNicholas Rd., Detroit 12, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
duMont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Atrax Co., Newington, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429 Royal Oak, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Clarkson, Inc., 320 Ontario St., Toledo, O.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich. (Thread)
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 1440 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Inc., Springfield, Vt.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
OK Tool Co., Milford, N. H.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Verner Hwry., Detroit 1, Mich.

CUTTERS, Rotary

See Files & Burs, Rotary.

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

CUTTING AND GRINDING FLUIDS

Cimcool Div., Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

(*Continued on page* 320)

NEW–DIFFERENT

4-POST DRILLER AND TAPPER

26 Individual Machine Operations in one unit!

Once again BAUSH ingenuity and experience of many years has produced an hydraulic automatic multi-spindle machine tool designed specifically to speed production on Tank Engine oil pans.

SPECIFICATIONS:

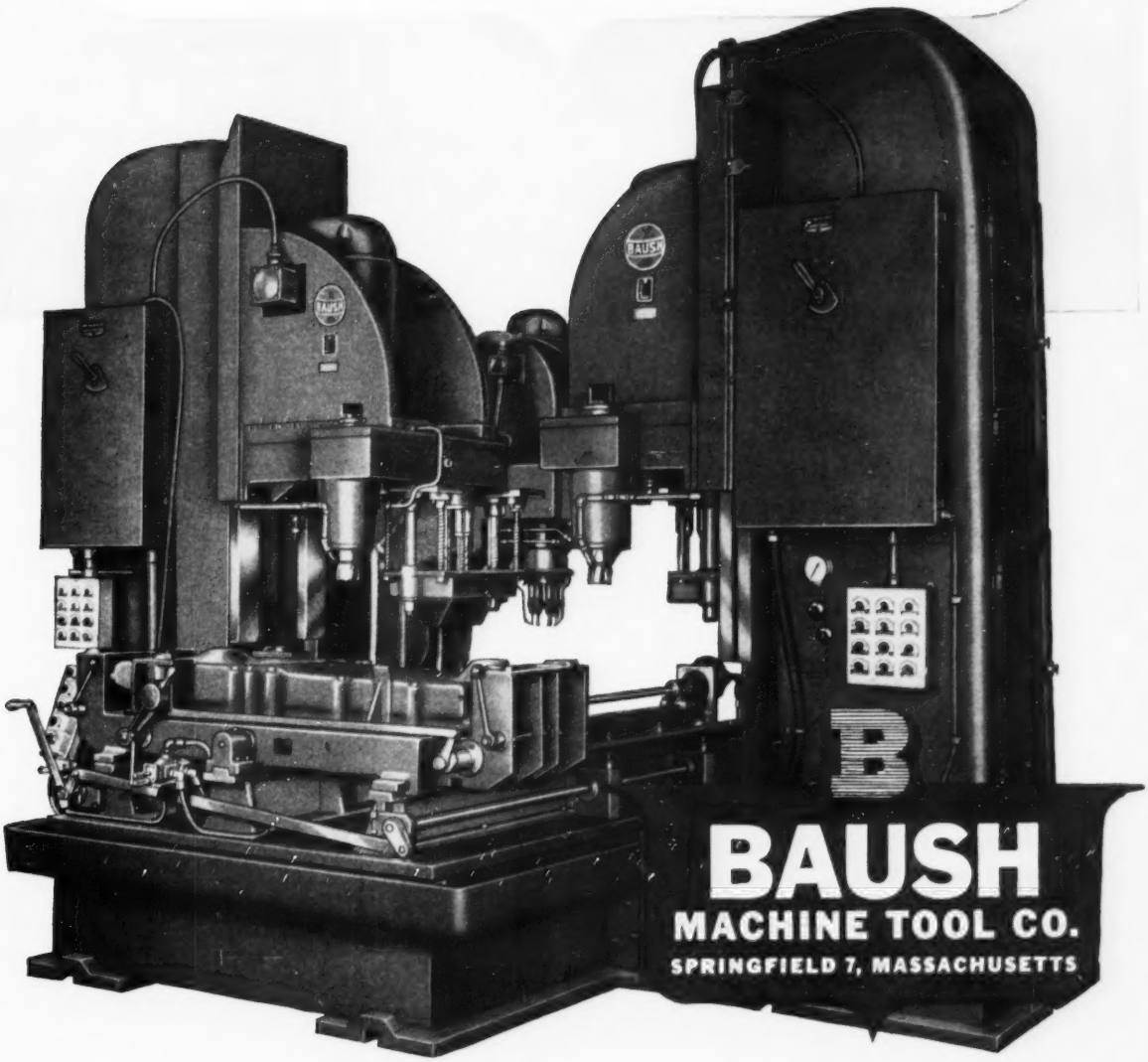
This 4-Way, 4-Post Combination Drilling and Tapping Machine consists of 2 Vertical W-7 Hydraulically operated units. Each unit has a 7 spindle, fixed center, ball-bearing head and two welded steel columns, each with 6 individual lead-screw spindle heads.

Hydraulically operated fixture is a 4-station horizontal duplex set up mounted on large welded steel bed, around which the four vertical machines are built. Steel ways are hardened and ground.

OPERATIONS:

Parts: Tank engine oil pan.
Part lowers into slide with a hoist.

Station 1: Load and unload.
Station 2: Core bore 2 holes.
Station 3: Combination drill and countersink 12 holes.
Station 4: Tap 12 holes.



For Dependable Pump Replacements!

GET THIS HELPFUL NEW GUIDE TO SMALL INDUSTRIAL PUMPS



The new Tuthill Catalog No. 101 on the Model L series of pumps presents the information you need to help you in selecting the right pumps for replacements on your equipment. It includes a special Pump Guide on Model L applications, plus complete specifications and performance data. Write for your copy of Catalog No. 101 today.



Tuthill Model L Pumps are designed for **LUBRICATING, HYDRAULIC, TRANSFER, CIRCULATING and BURNING OILS SERVICE.**

TUTHILL PUMPS FOR THE PURPOSE

TUTHILL PUMP COMPANY

Dependable Pumps since 1927

939 East 95th Street, Chicago 19, Ill.

Canadian Affiliate: Ingersoll Machine & Tool Company, Ltd., Ingersoll, Ontario, Canada

Shear-Speed Chemical Products, Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).
Consolidated Mch. Tool Co., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Johnson Mfg. Co., Albion, Mich.
Landis Machine Co., Waynesboro, Pa. (Pipe).
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).
Pines Engineering Co., Inc., Aurora, Ill.

CUTTING-OFF MACHINES, Abrasive Wheel

Allison Co., Bridgeport, Conn.
Campbell Mch. Div., American Chain & Cable, 929 Conn. Ave., Bridgeport, Conn.
Columbia Machinery & Engrg. Corp., Hamilton 1, O.
Delta Power Tool Div., Rockwell Mfg. Co., 614 G. N. Lexington Ave., Pittsburgh 8, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.

CUTTING-OFF MACHINES, Cold Saw

See Sawing Machines, Circular.

CUTTING-OFF MACHINES, Metal Band Saws

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob Bros., Grafton, Wis.

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Kennametal, Inc., Latrobe, Pa.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

CUTTING-OFF WHEELS, Abrasive

Bay State Abrasive Co., Westboro, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

CYLINDERS, Air

Bellows Co., 230 W. Market St., Akron, Ohio.
Hannafin Corp., 1101 S. Kilbourn Ave., Chicago.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

(*Continued on page* 322)

For more information on products advertised, use Inquiry Card, page 247

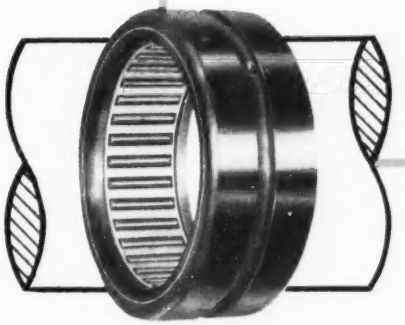


True Running in ANY position!

•

VERTICAL — HORIZONTAL — TILTED —OR OVERHUNG APPLICATIONS





NO ROLLER SKEWING — Orange Cage Design assures permanent alignment of rollers

ORANGE

Cage Type

NEEDLE BEARINGS

Orange Cage Type Needle Bearings have brought the space-saving, high-load features of needle bearings to many applications hitherto unsuited for conventional types. Not only are they true running in any position, but are successful on relatively high-speed applications and less affected by misaligned mountings or uneven loading.

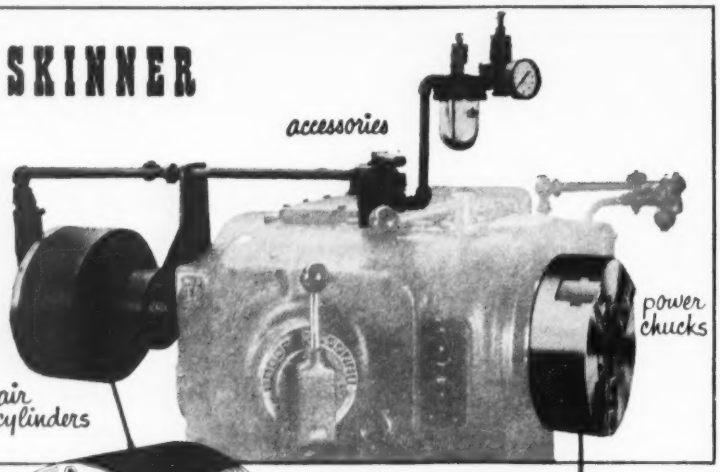
In the Orange cage design, square end rollers are held in alignment by pockets of a free-floating, land-riding cage of anti-friction, non-ferrous metal. Cage merely guides—does not wear on rollers. Operation is exceptionally smooth and quiet, with long, trouble-free life.

Stock sizes from ½" to 8" shaft diameters, fully interchangeable with standard heavy-duty needle bearings. Write for Engineering Data Book.

ORANGE ROLLER BEARING CO., INC., 552 Main Street, Orange, N. J.

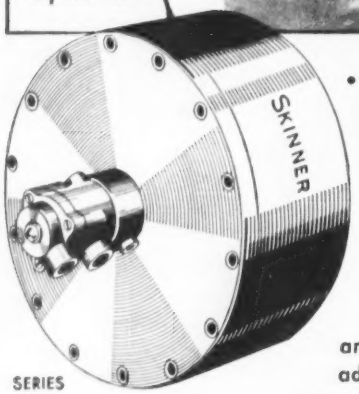
SKINNER

accessories



power chucks

air cylinders



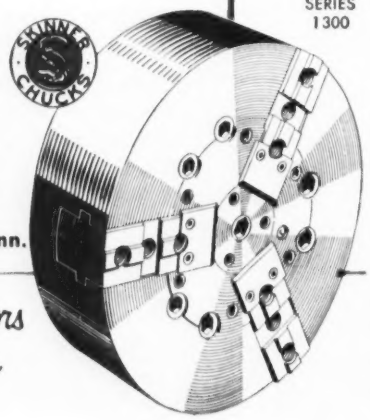
SERIES 2100

...for every high production need!

The Skinner line of power chucking equipment has the strength, rigidity and design features so essential for today's production needs. Chucks are available from 6" to 21" with forged steel bodies, and with either 2 or 3 adjustable or non-adjustable jaws. Exclusive sliding wedge construction grips internal or external work positively regardless of jaw position. The chuck will not release the work, even if air line is broken, until operator actuates the draw bar. Skinner double-acting rotating (series 2100 for speeds up to 1500 R. P. M.) and non-rotating air cylinders are available with semi-steel bodies for all sizes of Skinner power chucks, and for actuating all types of holding fixtures and tailstocks. Series 2200 double-acting rotating air cylinders have aluminum bodies for efficient operation up to 3000 spindle R. P. M. Skinner accessories include hand-operating valves — complete air unit, including regulating valve, pressure gage and lubricator — filters — soft blank top jaws; draw bars — draw tubes, etc.

Write for catalog giving complete details on the Skinner line of power and manually operated chucks. And ask about new movie "Chucks and Their Uses" — available for free showings.

SERIES 1300



THE SKINNER CHUCK COMPANY

206 Edgewood Ave., New Britain, Conn.

Sold by leading distributors in every industrial area

CYLINDERS, Hydraulic

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Barnes, John S., Corp., Rockford, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
National Forge & Ordance Co., Irvine, Warren County, Pa.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DEALERS, Machinery

Botwinik Bros. of Mass., Inc., 14 Sherman St., Worcester, Mass.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

DEMAGNETIZERS

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Heald Mch. Co., 10 New Bond St., Worcester 6, Mass.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Taft-Pierce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Inc., Worcester, Mass.

DESIGNERS, Machine and Tool

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Hartford Specialty Mchry. Co., 287 Homestead St., Hartford, Conn.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIAMONDS AND DIAMOND TOOLS

Smit, J. K., & Sons, Inc. Murray Hill, N. J.

DIE-CASTING

See Castings, Die.

DIE-CASTING MACHINES

Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.

DIE CUSHIONS

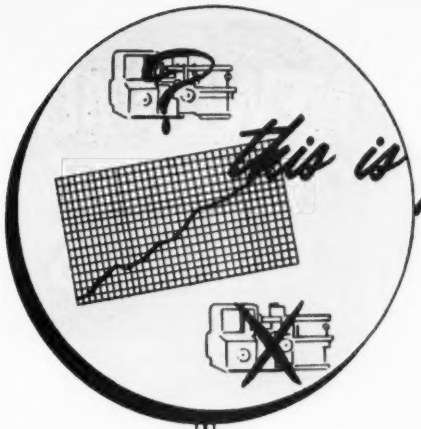
Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Clearing Mch. Corp., 6499 W. 65th St., Chicago, Ill.
Verson Allsteel Press Co., 93rd St. and S Kenwood Ave., Chicago, Ill.

DIE INSERTS, Carbide

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

(*Continued on page* 324)

For more information on products advertised, use Inquiry Card, page 247



this is your problem in 1954!

Industry is now planning the rejuvenation of its manufacturing processes and equipment for the competitive era ahead.*

It's a time-consuming job.

How can it be *speeded up* for *you?*

**see the 1953 ASTE Obsolescence Report.*



what ASTE is doing to help you

The American Society of Tool Engineers is assembling in Philadelphia's Convention Center on April 26 to 30 inclusive the latest in production equipment and processes available from over 450 manufacturers. The exhibits will be open to you and your key men during these five days, from 9:00 A.M. to 5:00 P.M. Included will be inspection and automation devices, machine tools, accessories, cutting tools, and allied equipment.

Simultaneously, a series of top-level Conferences will be held dealing with such major industrial problems as Plant Management, Automation, Precision Control, Metal Forming, and Assembly Methods.



it's up to your key men NOW!

. . . whether your company moves forward or falls behind in the competitive era ahead. To help you select the key men in your organization who definitely should visit the Exposition, the ASTE has prepared a "plan booklet" which covers every aspect of the ASTE Exposition and Conferences. Write today for a copy on your company letterhead. It will be mailed to you promptly, free of charge.



Available on request to all industrial executives.

This advertisement is sponsored by the 27,600 Members of

THE AMERICAN SOCIETY OF TOOL ENGINEERS

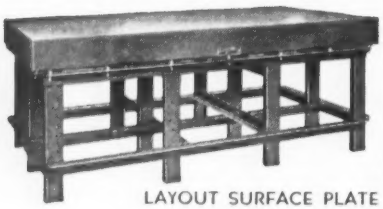
10700 Puritan Avenue

Detroit 38, Michigan

WHERE PRECISION COUNTS

SPECIFY

Challenge®



LAYOUT SURFACE PLATE

Precision-built for tool and machine industries, Challenge Equipment comprises a selection of time-saving devices for layout, inspection, checking, lapping, welding and assembly operations. Included in this line are Layout Surface Plates . . . Clamp Edge Layout Plates . . . Reading Tables . . . Checking Tables . . . Lapping Plates . . . Welding Tables . . . Surface Plates . . . Surface Plate Equipment . . . Bench Plates and Blocks. Check the coupon below for complete information on any or all products. 719



SEMI-STEEL SURFACE PLATE

Challenge

TRADE-MARK ®

THE CHALLENGE MACHINERY CO.
Office, Factories and Show Room:
GRAND HAVEN, MICHIGAN

Send details as checked below:

☐ Layout Surface Plates ☐ Work Benches
☐ Surface Plate Equip. ☐ Utility Bench
☐ Complete Catalog ☐ Welding Tables

Name _____

Firm Name _____

Street _____

City _____ State _____

DIEMAKERS' SUPPLIES

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DIEMAKING MACHINES

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Grob Bros., Grafton, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.
Oliver Instrument Co., 1410 E. Moumee St., Adrian, Mich.
Precise Products Corp., 1328-30 Clark St., Racine, Mich.

DIE SETS, Standard

Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp. 2895A W. Grand Blvd., Detroit 2, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.
Wales-Strippit Corp., N. Tonawanda, N. Y.

DIE-SINKING MACHINES

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIE-SINKING PRESSES

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Kearney & Trecker Corp., Milwaukee, Wis.

DIE STOCKS

See Stocks, Die.

DIES, Sheet Metal, Etc.

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Dreis & Krupp Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Mch. Co., Bridgeton, N. J.
John B., Manufacturing Co., Ellis St., New Britain, Conn.
Metal Carbides Corp., Youngstown, Ohio.
Mullins Manufacturing Corp., Salem, Ohio.
Niagara M ch. & Tool Wks. 683 Northland Ave., Buffalo, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wales-Strippit Corp., N. Tonawanda, N. Y.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Winzeler Mfg. & Tool Co., 1712 West Arcade Pl., Chicago 12, Ill.

DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Mansfield, Mass.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New Haven 15, Conn.

(*Continued on page* 326)

NEWCOMER
Controlled Quality
CARBIDES



for greater Production Economy

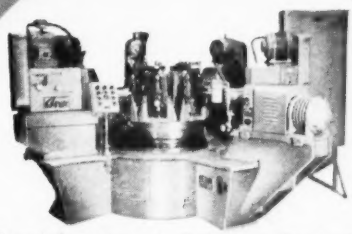
From start to finish, NEWCOMER CARBIDES are made in our own plant . . . to high controlled-quality standards.

NEWCOMER CARBIDES are made to give you greater production economy through heavier feeds, faster cutting speeds and greater wear resistance than most other carbides. Complete stocks of standard carbide blanks, cutting tools, and mechanically-held tools are available for ready delivery.
For your particular cutting problem, consult a Newcomer Tool Engineer . . . there's one located near you.

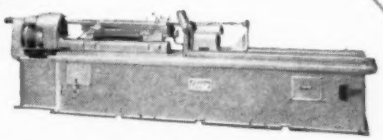
NP
CONTROLLED QUALITY CARBIDE

NEWCOMER PRODUCTS, INC.
Latrobe, Pa.
General Sales Office:
512 Franklin Ave., Pittsburgh 21, Pa.

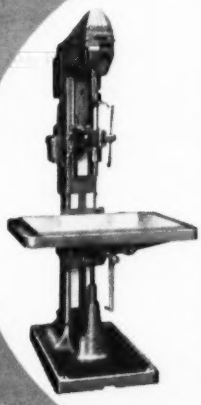
For more information on products advertised, use Inquiry Card, page 247



Special Automatic Indexing Production Drilling and Tapping Machine. Five No. 2 Avey Cam Feed Units and one Lead Screw Tapping Unit mounted horizontally around a 36" diameter, seven station indexing table, automatic, push button operation.



Deep Hole Drilling Machine. One Aveydraulic Deep Hole Drilling Unit, mounted on a sturdy fabricated steel base which contains the hydraulic power source and motor driven coolant system . . . torquematic withdrawal of drill . . . single or double end arrangement.



Standard sensitive and upright single or multiple spindle drilling and tapping machine . . . for holes up to 1½" diameter in Cast Iron. Complete with standard frame . . . reversing or non-reversing motor . . . hand or automatic feed.

Specialists

IN THE MANUFACTURE OF

PRODUCTION DRILLING MACHINERY

- HYDRAULIC DRILLING UNITS
- DEEP HOLE DRILLING UNITS
- CAM FEED DRILLING AND TAPPING UNITS
- WAY TYPE DRILLING AND TAPPING MACHINES
- STANDARD DRILLING AND TAPPING MACHINES
- AUTOMATIC INDEX TABLES

Avey

DRILLING MACHINE CO.
CINCINNATI 1, OHIO

WRITE FOR ENGINEERING CATALOG

There's an AVEY to fit your particular job



when a shim is

LAMINATED

here are the advantages you get:

Shims stamped from LAMINUM® look like solid metal but actually are made up of layers of .002 or .003 inch brass or steel. The laminations are solidly bonded together, over their entire surfaces.



REDUCED MACHINING COST:

You machine only to easy tolerances. The laminated shim is *adjustable*—you simply peel laminations of .002 inch brass or steel with a penknife—to get exactly the spacing you need. You cut costs without sacrificing quality.



SIMPLIFIED USE:

Shims come to you in one "pack" for each application. They are precision-stamped to your exact specifications. No counting, no stacking, no miking. Gauge is always known. No dirt or grit can lodge between layers.



SPEEDED PRODUCTION:

Final fitting can be done right at the job. You don't have to take parts back and forth for further machining, grinding or filing. No special skill required. The laminations adjust spacing quickly, easily.



ADDED SERVICE FEATURE:

Throughout the life of the machines you produce, the simple removal of a shim lamination provides a unique adjustment for the take-up of wear. Original clearances can always be restored.

SEND TODAY for our Engineering Data File

LAMINATED SHIM COMPANY, INC.

3901 UNION STREET • GLENBROOK, CONNECTICUT

CUSTOM SHIMS STAMPINGS SHIM STOCK

Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Geometric Tool Co., Westville Station, New Haven 45, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

DIES, Thread Rolling

Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

DISCS, Abrasives

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hill, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

DISINTEGRATORS

Metalmaster Div., Clinton Machine Co., Clinton, Mich.

DIVIDING HEADS

See Indexing and Spacing Equipment.

DOWEL PINS

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DRAFTING MACHINES

Universal Drafting Mch. Corp., 7960 Lorain Ave., Cleveland, Ohio.

DRESSERS, Grinding Wheel

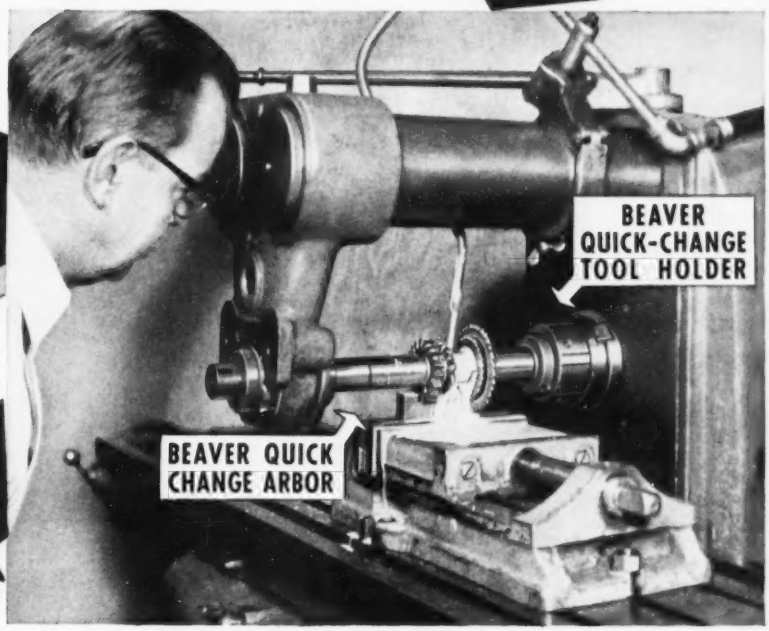
Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Erickson Tool Co., 2309 Hamilton, Cleveland, Ohio
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hoglund Engrg. & Mfg. Co., Inc., Berkeley Heights, N. J.
Metal Carbides Corp., Youngstown, Ohio.
Meyers, W. F. Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.
Western Tool & Mfg. Co., 1640 E. Wheeler St., Springfield, Ohio.

(*Continued on page* 328)

For more information on products advertised, use Inquiry Card, page 247



Save MACHINE DOWN-TIME



WITH Beaver QU... CHANGE TOOLING ... SET AT THE BENCH

Beaver Quick-Change Arbors for all slotting, face, straddle, and gang milling save machine time, improve quality, and hold accuracy on single, multiple, and transfer machine operations.

By using Beaver Quick-Change Arbors in Beaver Quick-Change Holders on your machines, down-time can be confined to the bench. This allows uninterrupted machine operation without costly reset-ups with each change of tools.

Beaver Quick-Change Arbors reduce trial and error rejects by holding a constant relationship between the flange and the collar of the arbor. Spacing of cutters can be accurately predetermined at the bench with simple "Jo" blocks or height gage and indicator.

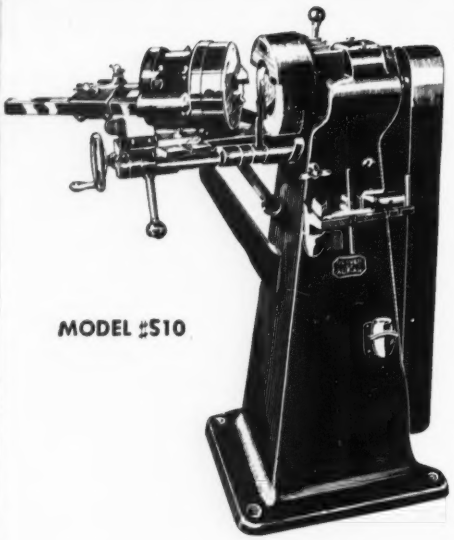
With Beaver Quick-Change Arbors your machines are free of costly down-time and cutter change from one set-up to another is a simple, quick operation. Prove Beaver Quick-Change Toolings superiority on your own operations.

STANDARD MACHINE TOOL ACCESSORIES CARRIED IN STOCK



CUT DRILL SHARPENING COSTS

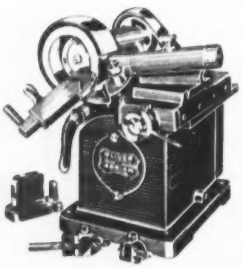
MACHINE GRIND with OLIVER DRILL POINTERS



MODEL #510

They Offer All These Advantages

1. **Help maintain production schedules with properly ground drills.**
2. **Assure balanced cuts because each lip does equal work, eliminating excessive drill costs and imperfect holes usually traced to improper grinding.**
3. **Sharpen drills to cut at higher speeds and produce more accurate holes.**
4. **Lengthen drill life.**
5. **"The only scientifically correct and theoretically perfect drill pointer," drilling specialists declare.**
6. **Important annual savings that are sufficient to quickly return initial investment.**



MODEL #21

OLIVER OF ADRIAN

No. 510 for drills ¼" to 3"—2-3-4 flute. Variable clearances. Variable point angles. Automatic operation.
No. 21 Oliver Bench Grinder. Hand operated for Drills No. 57 to ½". Right hand, with an improved point. Attachments are available for grinding oil hole drills, left hand and other special points.

Write for our free Booklet
"How To Produce More Holes With Your Drills!"
See our catalog in Sweet's Directory

OLIVER INSTRUMENT CO.
1410 E. MAUMEE • ADRIAN, MICHIGAN

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

DRIFTS, DRILL

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL HEADS, Multiple Spindle

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
Govro-Nelson Co., 1933 Antoinette St., Detroit 8, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd. Box 429, Royal Oak, Mich.
Bellows Co., 230 W. Market St., Akron, Ohio
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Keller Tool Co., Grand Haven, Mich.
Kingsbury Mch. Tool Corp., Keene, N. H.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

DRILL SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Thor Power Tool Co., Aurora, Ill.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLING MACHINES, Automatic

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., Mt. Grove St., Bridgeport, Conn.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.

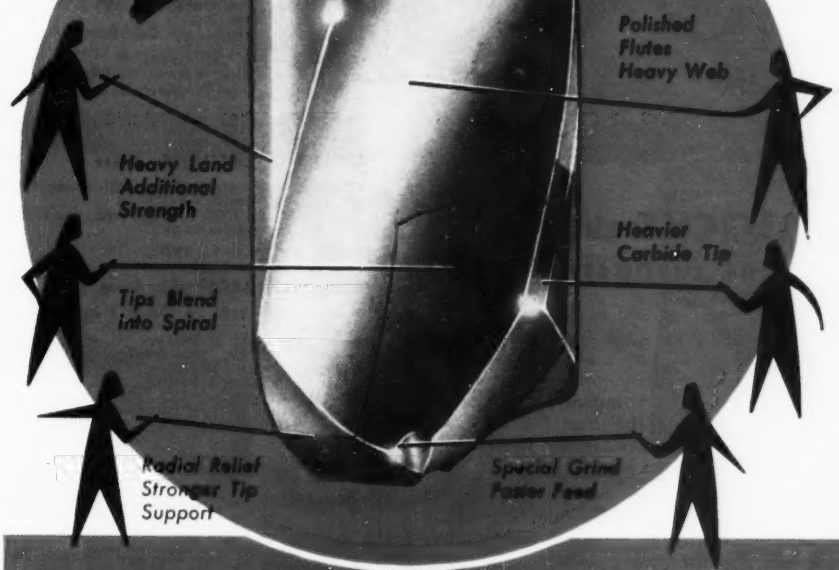
(*Continued on page* 330)

For more information on products advertised, use Inquiry Card, page 247

STC

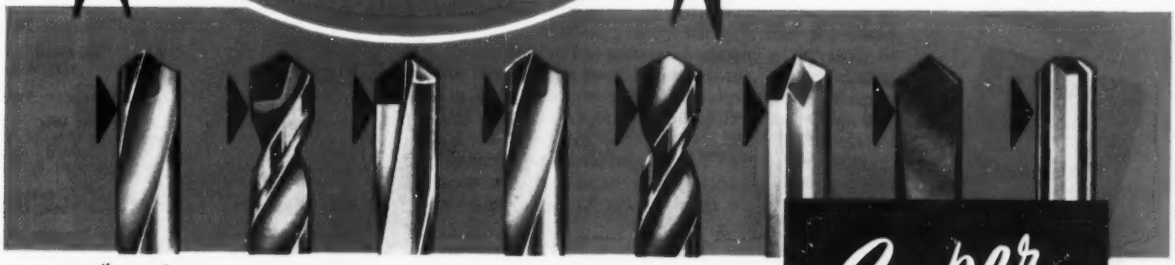
For Every Carbide Drilling Application
There's a STANDARD SUPER DRILL

NEW and really super!



Six points of superiority—Result of two years' research. Extensive tests indicate it's the most durable and the fastest cutting carbide twist drill developed to date. Feeds as high as 8" per minute in cast iron have been obtained. Stocked in fractional, wire and letter sizes for your convenience.

NEW LOW PRICES





QUALITY CARBIDE TOOLS

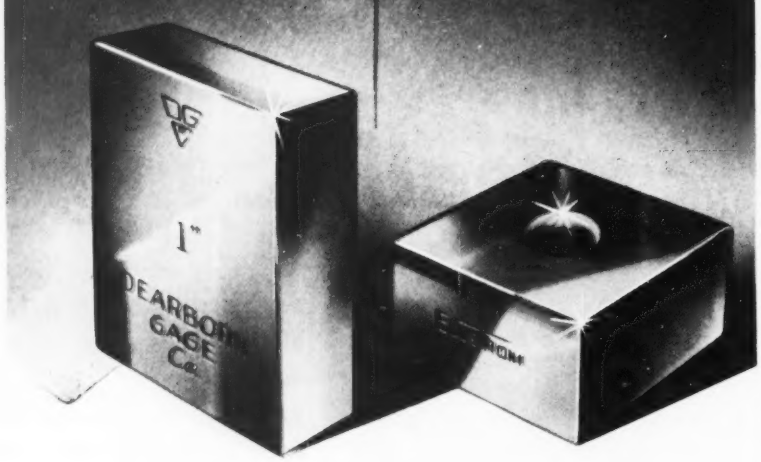
Super TOOL COMPANY

21650 Hoover Rd., Detroit 13, Michigan • 5210 San Fernando Rd., Los Angeles 3, California

For more information on products advertised, use Inquiry Card, page 247

Ellstrom

measuring in millionths for three generations



Here are GAGE BLOCKS that invite your most critical inspection!





WE'RE "fussy" about the gage blocks we make. And we hope, when *you* buy a set, that you'll be fussy, too. Because only by your own critical, impartial inspection of each individual block can you come to appreciate the true full measure of quality, value, and dependability inherent in Ellstrom Chromium Plated Standards.

Yes, we'd like you to check any set of Ellstrom gage blocks that meets your particular inspection or production requirements. Check them block-by-block for size . . . for their consistent adherence to closer than specified accuracy. For flatness . . . parallelism . . . and the finish of their hard, uniform chromium plated gaging surfaces that give you greater serviceability, longer wearing millionths. And, too, test the fine materials used in their manufacture . . . for coefficient of expansion and controlled metallurgical stability. Then, we're sure, you'll agree that it pays to standardize on Ellstrom Standards.

IF YOU BUY GAGE BLOCKS, send for your free copy of this new Ellstrom Standards Catalog. Contains complete specifications and prices on the entire Ellstrom line of gage block sets, accessories, individual blocks, wear blocks, inspection service and trade-in plan. Write today!



ELLSTROM STANDARDS DIVISION
Dearborn Gage Company • 22035 Beech Street • Dearborn, Michigan
Originators of Chromium Plated Gage Blocks

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kingsbury Mch. Tool Corp., Keene, N. H.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Wales-Strippit Corp., N. Tonawanda, N. Y.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Bench

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.
Walker-Turner Div., Kearney & Treckar Corp., 900 North Ave., Plainfield, N. J.

DRILLING MACHINES, Boiler

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland.

DRILLING MACHINES, Deep Hole

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Bellows Co., 230 W. Market St., Akron, Ohio.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Wales-Strippit Corp., N. Tonawanda, N. Y.

DRILLING MACHINES, Gang

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K. Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

(Continued on page 332)

For more information on products advertised, use Inquiry Card, page 247

THESE MACHINE TOOL BUILDERS RELY EXCLUSIVELY ON US INDIVIDUAL LEAD SCREW TAPPERS WITH SHAVED GEARS AND THE PATENTED *SAFETY TAP HOLDER*

Only with the U. S. ***Safety Tap Holder*** are the spindles automatically re-set for continuous machine cycling during the prevention of tap breakage due to bottom tapping, dull taps or holes not drilled.



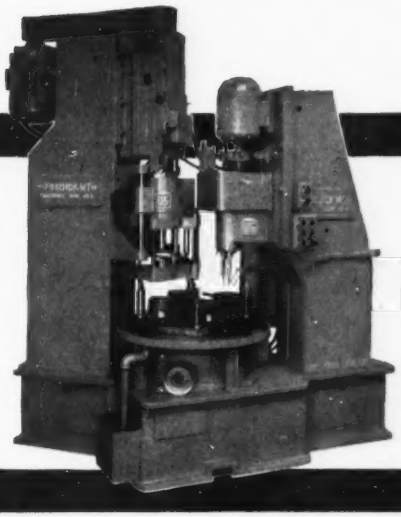
AVEY DRILLING MACHINE CO., Covington, Ky.

This complete tapping machine has provisions for a fifth U. S. Head to be added at a later date. All lead screw tappers are equipped with shaved gears and the U. S. patented ***Safety Tap Holders***.



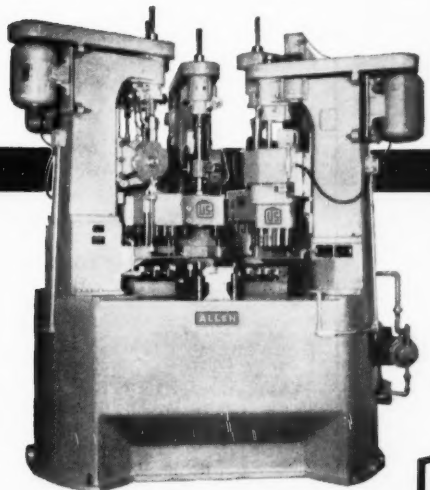
LEMAIRE TOOL & MFG. CO., Dearborn, Mich.

This machine drills, reams, chamfers and taps holes in a crank shaft for a farm tractor engine using a U. S. combination head, having individual lead screws with the U. S. ***Safety Tap Holder*** at the tapping station.



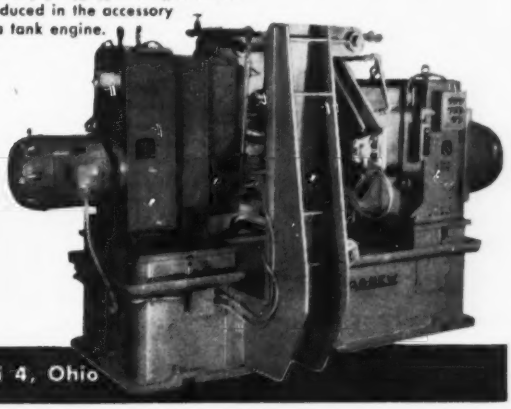
FOSDICK MACHINE TOOL CO., Cincinnati, Ohio

Combination drill and tapping machine still in use after many years, at an automotive accessory plant. Operation performed on a motor sheave.



AGNEW ELECTRIC CO., Milford, Mich.

A complete tapping machine having a total of 76 spindles. One 38 spindle, one 20 spindle and one 18 spindle U. S. individual lead screw tapper. Straight threads ¼-20 to ½-13 and tapered pipe ⅛-¾ class #3 thread were produced in the accessory case of a tank engine.

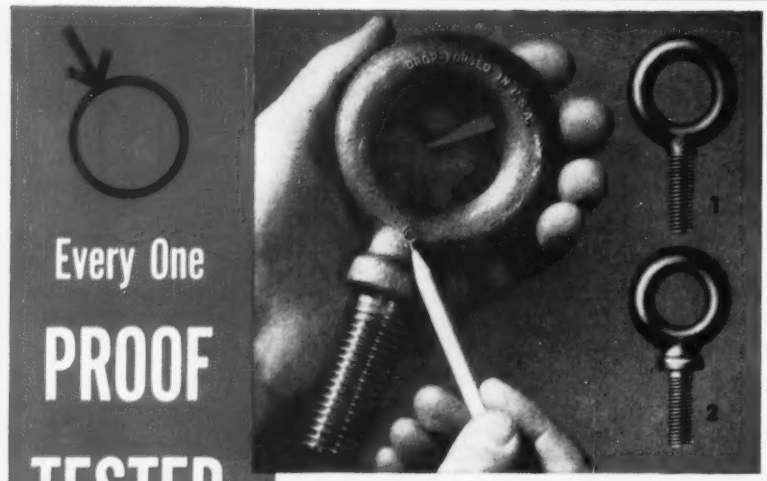


CHARLES G. ALLEN CO., Barre, Mass.

This machine has operated 16 hours per day since 1950, performing a bottom tapping operation in every cycle without a replacement part required on any portion of the lead screw spindle.

US HEADS

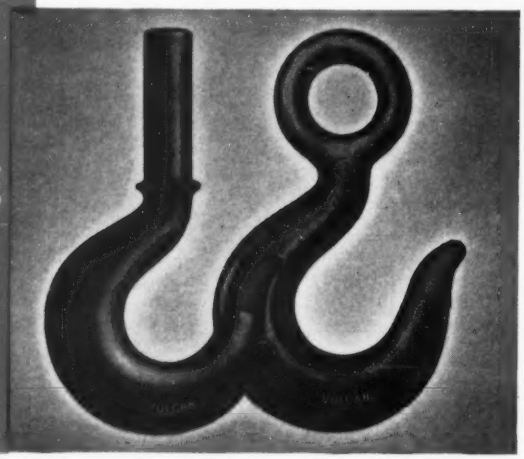
U. S. DRILL HEAD CO., 616-618 Burns St., Cincinnati 4, Ohio



Every One
PROOF
TESTED
50%
Beyond
"Safe Working
Load"

WILLIAMS "VULCAN"® EYE BOLTS, drop-forged in plain or shoulder patterns — blank or threaded. 1. Plain — capacities from .7 to 16 tons 2 Shoulder — capacities from .2 to 13 tons.

WILLIAMS "VULCAN"® HOIST HOOKS are drop-forged in Shank or Eye (weldless) patterns with throat openings 1 to 4½" and capacities up to 25 tons.



Your triple quality guarantee of SAFETY!

The circular identifying mark on Williams hoist hooks and eye bolts means that each one has been *individually proof-tested, on a standard tension machine, to at least 50% beyond its rated* "Safe Working Capacity". They are drop-forged, heat-treated and proof-tested to assure you maximum strength and dependable service. Don't accept less. WRITE for Catalog 201.

WILLIAMS
INDUSTRIAL TOOLS
"The Broadest Line of Its Kind"



PLUS local service from a Williams Distributor

J. H. WILLIAMS & CO. 407 Vulcan Street Buffalo 7, N. Y.

DRILLING MACHINES, Horiz. Duplex

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Edlund Machinery Co., Cortland, N. Y.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

DRILLING MACHINES, Horizontal Portable

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.

DRILLING MACHINES, Inverted

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

DRILLING MACHINES, Multiple Center Column Type

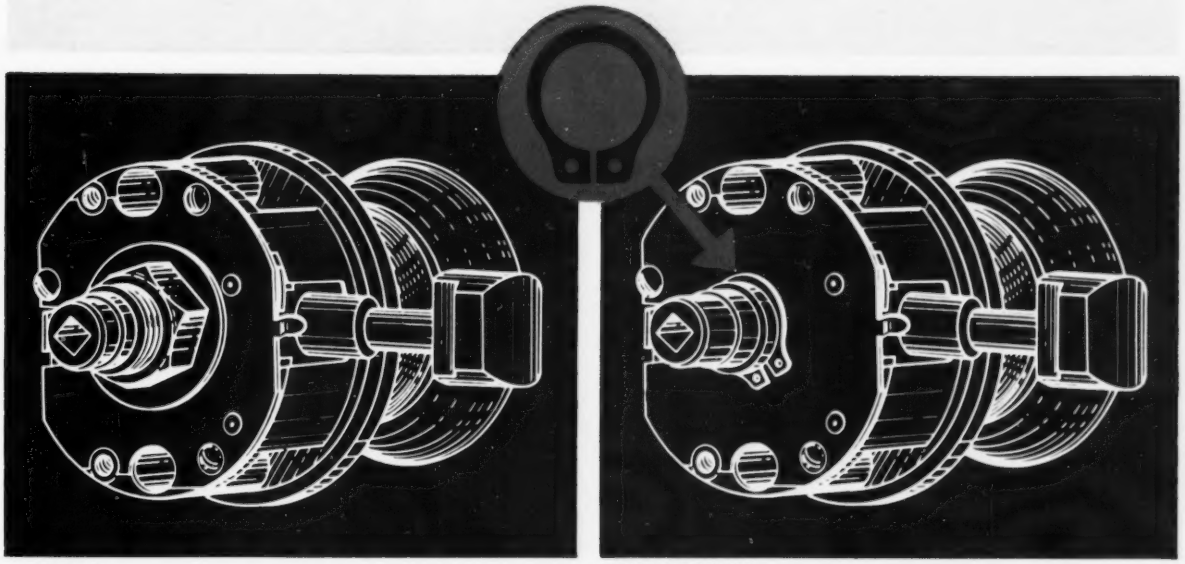
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.

DRILLING MACHINES, Multiple Spindle

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles, Calif.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Greenlee Bros. & Co., 12th and Columbia Ave., Rockford, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.

(*Continued on page* 334)

Waldes Truarc Ring Replaces Nut and Washer ...Cuts Costs $5.28 Per M...Speeds Assembly by 50%



OLD WAY. Main shaft required costly threading. Assembly was slowed by the double application of washer and nut and time-consuming tightening operation.

TRUARC WAY. Truarc Retaining Ring snaps quickly and simply over shaft. Lock assembly is secured in one fast operation. Virtually all play is eliminated from lock.

NEW DESIGN USING WALDES TRUARC RING PERMITTED THESE SAVINGS

OLD WAY

Cost of Nut	$10.00	*per thousand*
Cost of Washer	3.80	" "
Labor for Threading . . .	2.00	" "
Assembly	3.00	" "
TOTAL	**$18.80**	

TRUARC WAY

Cost of Truarc Ring and Grooving Operation . .	$11.52	*per thousand*
Assembly	2.00	" "
TOTAL	**$13.52**	

J. Chesler and Sons, Inc., Brooklyn, N.Y., manufacturers of the pre-assembled "Reddi-Mount" cylindrical lockset, uses a single Waldes Truarc Retaining Ring instead of an old fashioned nut and washer to secure the entire assembly of their lock. This new, improved fastening method enables Chesler to eliminate costly threading . . . save money on material . . . speed assembly time by 50% and produce an improved, more durable product.

You, too, can save money with Truarc Rings. Wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better, more economical job. Waldes Truarc Rings are precision-engineered . . . quick and easy to assemble and disassemble.

Find out what Waldes Truarc Retaining Rings can do for you. Send your blueprints to Waldes Truarc engineers.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool



SEND FOR NEW CATALOG



WALDES TRUARC

REG. U. S. PAT. OFF.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,382,947; 2,382,948; 2,416,852; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,420,941; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,509,081; AND OTHER PATENTS PENDING.

M016

Waldes Kohinoor, Inc., 47-16 Austel Pl., L. I. C. 1, N. Y.

Please send me the new Waldes Truarc Retaining Ring catalog.

(Please print)

Name.....

Title .....

Company .....

Business Address.....

City..... *Zone*..... *State*.....

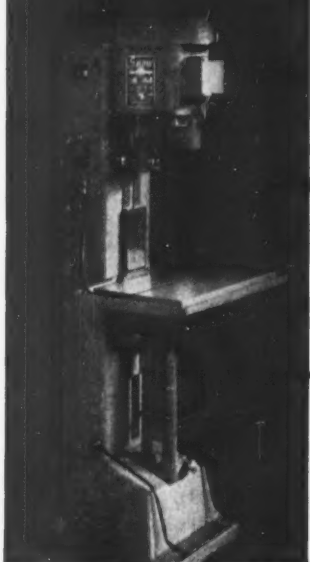
For more information on products advertised, use Inquiry Card, page 247

Never Before

SO MANY ADVANTAGES for HIGHEST PRODUCTION

4800 PER HOUR!
3800 PER HOUR!
2500 PER HOUR!

For Top Production



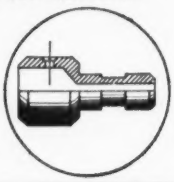
SNOW

FULL UNIVERSAL MACHINES

Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

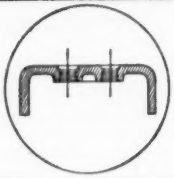
DRILLING

Crossdrill and C'T" Sink 1/16" Hole
Material—Brass
Production—4800 per hour
Fixture—#15 Vertical index
Equipment—#1-UD Drilling Machine



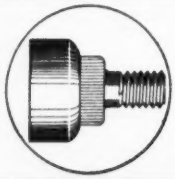
TAPPING

Tap Two #10-32 Holes
Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine



THREADING

3/8"—24 Thread—1/2" Long
Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

Submit Sample Parts f

SNOW

MANUFACTURING COMPANY
435 Eastern Ave., Bellwood, Illinois
(Chicago Suburb)

Single Spindle Verticals • Two-Spindle Verticals • Two-Spindle Horizontals • Automatic Nut Tapping Machines • Drill Press Tap Heads • Automatic & Semi-Automatic Jigs & Fixtures

Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Radial

Adcock & Shipley Ltd., Ash St., Leicester, England
American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Associated Mch. Tool Corp., P. O. Box 9666, 535 McNeilly Rd., Pittsburgh 26, Pa.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Carlton Mch. Tool Co., 3000 Spring Grove Ave., Cincinnati 25, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kaukauna Machine Corp., Kaukauna, Wis.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLING MACHINES, Rail

See Drilling Machines, Gang.

DRILLING MACHINES, Sensitive

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Wales-Strippit Corp., N. Tonawanda, N. Y.

DRILLING MACHINES, Upright

Avery Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.

(*Continued on page 336*)



Brilliant New Machine Design

CRACKS "BARRIER" PROBLEM with OILGEAR FLUID POWER

Once the "forge-it-in-mid-air" idea occurred to the Chambersburg Engineering people, there were two "barrier" problems to be smashed before the idea became a brilliant reality. Something of the seriousness of the problems is indicated by the fact they spent 10 years to get the right, precise integration of movements and forces required.

One problem, that of getting the blanks to be forged into the right place at the right time for the mid-air forging blow, was eventually solved by recourse to *Any*-Speed Oilgear Fluid Power. The standard totally enclosed Oilgear Transmission with integral electro-hydraulic control gave the designers of the Cecomatic Impacter remote, interlocked, precise control of the conveyor . . . quick, cushioned acceleration . . . high traverse speed . . . fast, cushioned deceleration . . . smooth stop and dwell in forging position; all at the speed and accuracy they needed . . . just as so often in the past Oilgear has given *other* machine designers what *they* wanted.

Maybe your problem can be solved, your machine's performance improved by the smooth, swift acceleration and deceleration of the *Any*-Speed Oilgear. Maybe you need its extreme precision of controllability . . . or any of a dozen other remarkable characteristics. In addition you get simplicity, ease of assembly into your machine, ruggedness, dependability, accessibility, a unique freedom from maintenance.

But whatever your need, *you have not exhausted all possibilities in machine design if you have not investigated Oilgear Fluid Power Pumps, Motors and Transmissions exhaustively.* You too may have a world beater in your hands. THE OILGEAR COMPANY, 1569 W. Pierce St., Milwaukee 4, Wis.

Cecomatic Impacter doubles, triples, quadruples—octuples forging production! No jar or vibration. Less metal stress and die wear. Blanks load into conveyor automatically. And automatically the Oilgear type AXB-33 Variable Speed Transmission accelerates conveyor swiftly, smoothly, it smoothly stops with forging blank "dead on target," waits for the forging blow, then accelerates forged part away and new blank into position. Oilgear is adjustable up to 40 cycles per minute, is easily set to any required index distance which is then maintained under complete automatic control with unvarying precision.

OILGEAR

OILGEAR

HELD IN QUARANTINE



. . . and not released until proved fit!

That's the fate of all PERKINS precision, custom-made GEARS prior to shipment. The folks in our inspection department — a section of which is shown — may be a suspicious lot (never mind what some other people in our plant call them), but when they certify a gear to be sound and "as specified" you can bet your last bottom dollar that the end-product of which they ultimately become an integral part, will be a *better* product!

NOTE 1: A new product is the **Perkins Precision Spring Coiler.** This coiler (patent applied for) turns out precision springs — any type, shape, size, from wire sizes .005 to .125.

2: Another new product — the **Perkins "Bendit 15"** — a patented metal forming machine bends and shapes sheets, rods; strips tubing into innumerable complex as well as simple forms that would be difficult or impossible to make by other means. Eliminates need for expensive tools or specialized skills. Ht. 47", net wt. 200 lbs. Write today for descriptive catalogs, prices etc.

PERKINS MAKES:
Helical Gears
Bevel Gears
Sprockets
Ratchets
Worm Gears
Spiral Gears
Spur Gears with shaved or ground teeth
Ground Thread Worms

PERKINS MACHINE & GEAR COMPANY
WEST SPRINGFIELD, MASSACHUSETTS

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St. Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Orban Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Wales-Strippit Corp., N. Tonawanda, N. Y.

DRILLING MACHINES, Wall, Radial

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.

DRILLS, Center

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Core

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Erickson Tool Co., 2309 Hamilton, Cleveland, Ohio
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DRILLS, Deep Hole

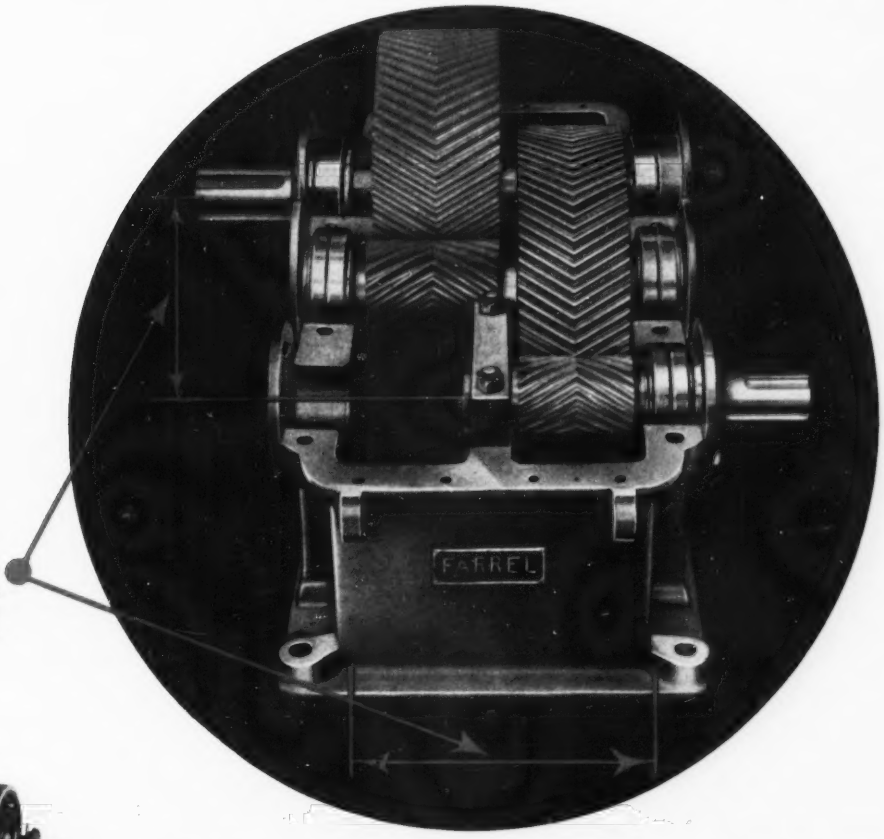
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(*Continued on page* 338)

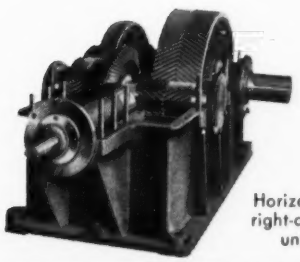
For more information on products advertised, use Inquiry Card, page 247

A special talent

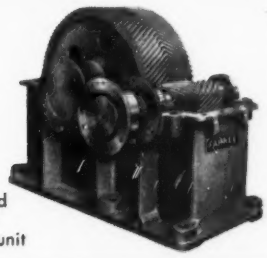
makes this the right speed reducer for the job



Relation of center distance and width of case gives latitude in proportioning gears to specific conditions.



Horizontal right-angle unit



Standard single reduction unit

The design of a Farrel® speed reducer is flexible. Its adaptability in critical detail gives it advantages over "standardized" units which result in the solution of innumerable application problems. You can ask for—and get—a unit that will fit your requirements exactly.

The gears and pinions can be proportioned to meet specific load, speed and service requirements. Input and output shafts can be varied in size, in material, and in extension. Even some housing dimensions can be modified to meet problems in mounting.

Remember too, that the gearing in a Farrel speed reducer has teeth generated by the famous Farrel-Sykes method—a process that assures accuracy of tooth spacing, profile and helix angle. The herringbone design provides evenly distributed pressure over each tooth, from tip to working depth line. This means that there is no tendency for the teeth to wear unevenly, and thus shorten the life of the gears.

Farrel speed reducers are made in a number of types, with a wide range of ratios and capacities. For more about these adaptable units, write for a copy of bulletin 449.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Boston, Akron, Detroit, Chicago, Memphis, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans

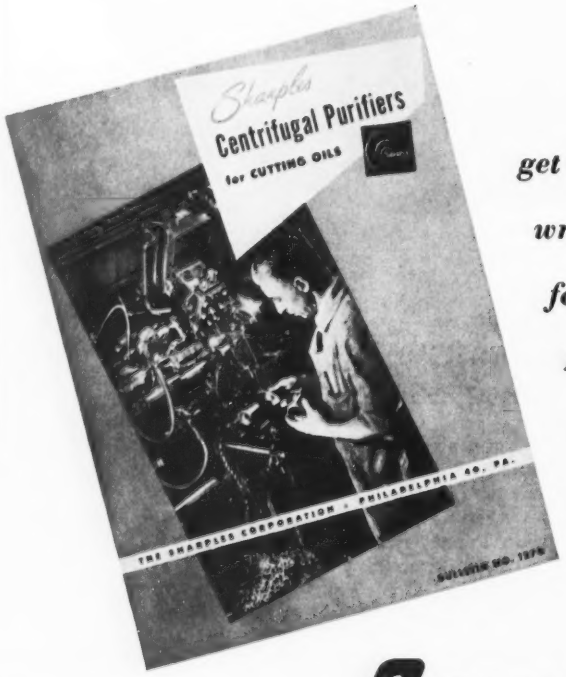
FB-880

Farrel-Birmingham®

the answer to

your question:

SHOULD I PURIFY CUTTING OIL IN MY SHOP?



get the facts—

write today

for Sharples

Bulletin

no. 1270

SHARPLES

THE SHARPLES CORPORATION · 2300 WESTMORELAND ST. · PHILA. 40, PA.

NEW YORK • PITTSBURGH • CLEVELAND • DETROIT • CHICAGO
NEW ORLEANS • SEATTLE • LOS ANGELES • SAN FRANCISCO • HOUSTON

Associated Companies and Representatives throughout the World

DRILLS, Portable Electric

Black & Decker Mfg. Co., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Millers Falls Co., Greenfield, Mass.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.

DRILLS, Portable Pneumatic

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Thor Power Tool Co., Aurora, Ill.

DRILLS, Rachet

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap — Die Corp., Greenfield, Mass.
Morse Twist Drill &Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Twist

Besley-Welles Corp., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Wire

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRIVES, Chain

Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

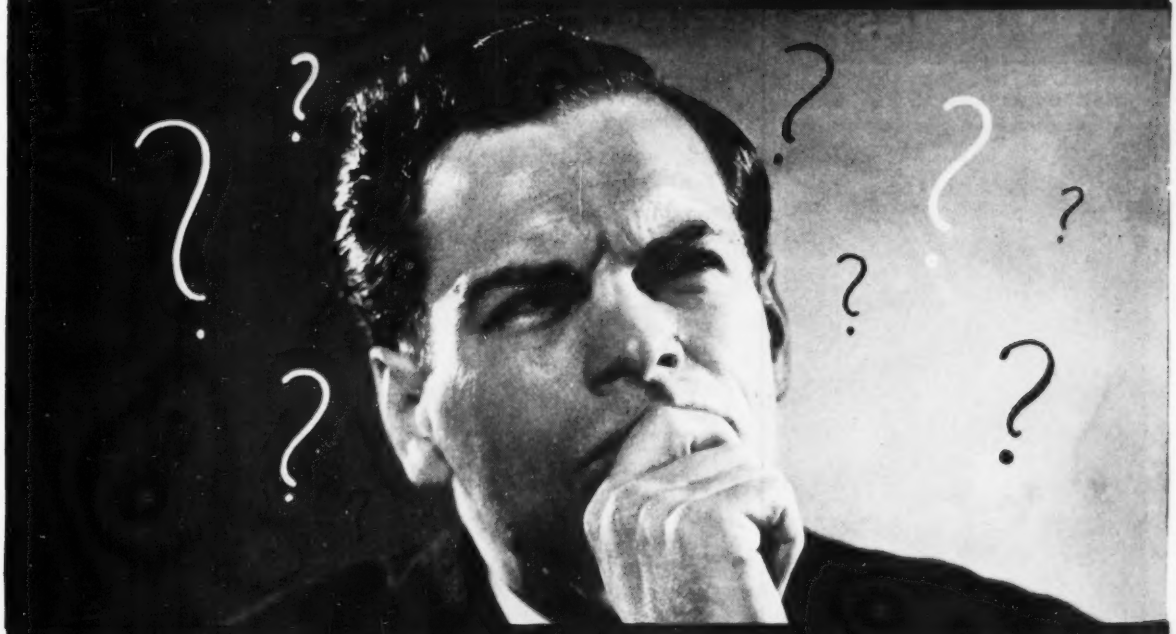
DUPLICATORS

Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rickford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois, Detroit, Mich.

(*Continued on page* 340)

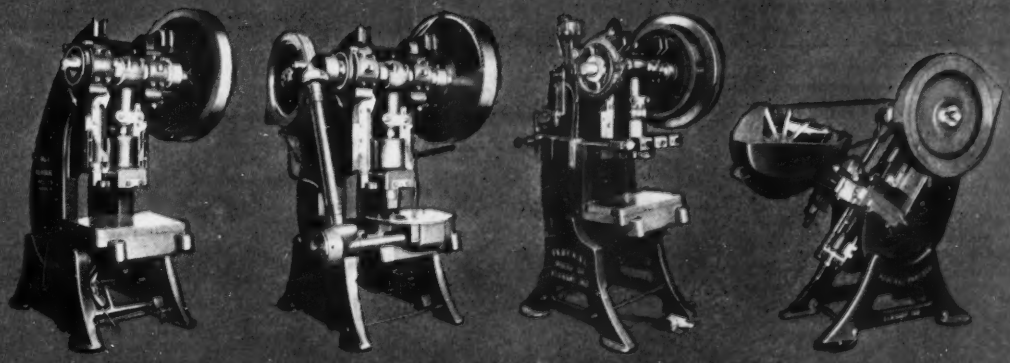
For more information on products advertised, use Inquiry Card, page 247

GOT PRESSROOM PROBLEMS?



Solve 'em with

FEDERAL *Open back Inclinable* PRESSES



STANDARD

Open back. Safe, front-operated reciine. Herr-repeat clutch. 18 to 80 ton capacities — geared and flywheel types.

DIAL FEED

...cal, accurate handling of many ...operations. Automatic safety stop. 18 to 80 ton capacities — geared and flywheel types.

HIGH SPEED

Air clutch with electro-pneumatic control, fine on-the-fly starting and stopping. Available in 18 to 80 ton capacities.

SPECIAL

Capscrew, bolt trimming and extruding press. Available in 26 to 65 ton sizes. Special presses for automatic roll or pinch feeds.

Write for New Catalog No. 13 / **THE FEDERAL PRESS COMPANY,**

need information on
milling machines?

reach for Machine Tool Catalogs



"... a great time-saver"

These manufacturers' catalogs are instantly available in Section 2 of your Machine Tool Catalogs:

Brown & Sharpe Mfg. Co.	Kearney & Trecker Corp.
Cincinnati Milling Machine Co.	Kent-Owens Machine Co.
Giddings & Lewis Machine Tool Co.	Knight, W. B., Machinery Co.
Greaves Machine Tool Co.	Motch & Merryweather Machinery Co.
Hall Planetary Co.	Rowbottom Machine Co.
Innocenti	Sundstrand Machine Tool Co.

ALSO: The following catalogs, in other sections of your Machine Tool Catalogs, contain information on milling machinery:

Armstrong-Blum Mfg. Co.	Landis Tool Co.
Armstrong Bros. Tool Co.	Motch & Merryweather Machinery Co.
Besly-Welles Corp.	Norton Co.
Bryant Chucking Grinder Co.	O'Neil-Irwin Mfg. Co.
Bullard Co.	Osborn Mfg. Co.
Consolidated Machine Tool Corp.	Reid Bros. Co., Inc.
Dake Engine Co.	Rivett Lathe & Grinder, Inc.
Davis & Thompson Co.	Seneca Falls Machine Co.
Fosdick Machine Tool Co.	Sheffield Corp.
General Mfg. Co.	Sheldon Machine Co. Inc.
Giddings & Lewis Machine Tool Co.	Snyder Tool & Engineering Co.
Gisholt Machine Co.	Taft-Peirce Mfg. Co.
Greenlee Bros. & Co.	Thomas Machine Mfg. Co.
Johnson Machine & Press Corp.	Verson Allsteel Press Co.
L & J Press Corp.	Wales-Strippit Corp.

In other sections of the File you will find additional catalogs containing useful information on a wide range of machine tools and accessories.

Sweet's Catalog Service

Division of
F. W. Dodge Corporation
119 West 40th Street, New York 18, N. Y.

DUST COLLECTORS
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Pangborn Corp., Hagerstown, Md.
Vulcan Tool Co., 777 Lorain St., Dayton 10, Ohio.

DUST CONTROL SYSTEMS
Pangborn Corp., Hagerstown, Md.

ELECTRICAL EQUIPMENT
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

EMERY WHEEL DRESSERS
See Dressers, Grinding Wheel.

EMERY WHEELS
See Grinding Wheels.

ENGRAVING MACHINES
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.

EXTRACTORS, Screw
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

FACING MACHINES
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
National Automatic Tool Co., Inc., S. 7th and N Sts. Richmond, Ind.

FANS, Exhaust, Electric Ventilating
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
General Electric Co., Schenectady 5, N. Y.

FEEDS FOR PRESSES, Automatic
Bellows Co., 230 W. Market St., Akron, Ohio.
Federal Press Co., 600 Division and Big Four R. R. Elkhart, Ind.
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

FELT, For All Applications
American Felt Co., Glenville, Conn.

FILES, Hack
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Hand
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Heller Bros. Co., Newcomerstown, Ohio.
Nicholson File Co., 23 Acorn St., Providence, R. I.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Machine
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILES AND BURS, Rotary
Atrax Co., Newington, Conn.
Jarvis, Chas. L., Co., Middletown, Conn.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Thor Power Tool Co., Aurora, Ill.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FILING MACHINES, Dies, Etc.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Grob Bros., Grafton, Wis.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILTERS, Air
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Keller Tool Co., Grand Haven, Mich.

FILTERS, Coolant and Oil
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Cuno Engrg. Corp., Meriden, Conn.
Industrial Filtration Co. (Delpark Corp.) 15 Industrial Ave., Lebanon, Ind.

FINISHES FOR MACHINES AND METAL PARTS
Lowe Bros. Co., Dayton, Ohio.
Ransburg Electro-Coating Corp., 1234 Barth, Indianapolis 7, Ind.

FLEXIBLE COUPLINGS
See Couplings, Flexible.

FLEXIBLE SHAFT EQUIPMENT
Jarvis, Chas. L., Co., Middletown, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

FORGINGS, Hollow Bored
Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

FORGINGS, Drop
Bethlehem Steel Co., Bethlehem, Pa.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORGINGS, Hollow Bored
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel
Bethlehem Steel Co., Bethlehem, Pa.
Cameron Iron Works, Inc., 1000 Silber Rd., Houston, Texas.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Morgan Engrg. Co., Alliance, Ohio.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Upset
Bethlehem Steel Co., Bethlehem, Pa.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORMING AND BENDING MACHINES
American Steel Foundries, Elmes Engrg. Div., Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif. (Stretch-Wrap).
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

(Continued on page 342)

For more information on products advertised, use Inquiry Card, page 247



There are lots of ways to

PIERCE METALS

...But here's

Precision Multiple Piercing at Lower Cost

DANLY HYDRAULIC METALWORKING EQUIPMENT

Pierce metal faster, with greater accuracy and at less cost. In a single setup for multiple piercing . . . or riveting, punch extruding or trimming . . . you can reduce costly handling by combining operations into a single setup. Danly Hydraulic Metalworking Equipment is engineered to meet your specific needs. Exclusive all-hydraulic action permits smooth operation, minimizes break-through shock, automatically strips each station and simplifies fixturing. Find out more about high production multiple hole piercing in a single setup—write today for special Danly Hydraulic Metalworking Equipment Bulletin.

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue • Chicago 50, Illinois

One setup pierces seven irregular holes and trims this car door inner window frame.

40 holes are pierced simultaneously in this automotive frame member on a Danly machine.

Irregular holes are pierced fast and accurately in this stainless steel jet engine part.

FORMING AND STAMPING MACHINES

Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

FORMING TOOLS or Tool Blanks

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Brown & Sharpe Mfg. Co., Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FRAMES, Machinery Welded

Mahon, R. H. Co., Detroit 34, Mich.

FURNACES, Heat-Treating

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

FURNITURE, Shop

Standard Pressed Steel Co., Jenkintown, Pa.
Western Tool & Mfg. Co., 1640 E. Wheeler St., Springfield, Ohio.

GAGE BLOCKS

Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

GAGES, Air

Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Comparator

Ames, B. C., Co., Waltham 54, Mass.
Comtor Co., 47 Farwell St., Waltham 54, Mass.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth

Ames, B. C., Co., (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Dial

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Electric

Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GAGES, Height

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Plug, Ring and Snap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.

(*Continued on page* 844)



For more information on products advertised, use Inquiry Card, page 247

National Tool Co.





Years of successful experience in special tooling and related production problems are yours for the asking. When the job requires special cutting tools call in your National Tool Co. representative. He is backed by more than 49 years experience in the engineering and manufacture of special cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros. Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GAGES, Surface

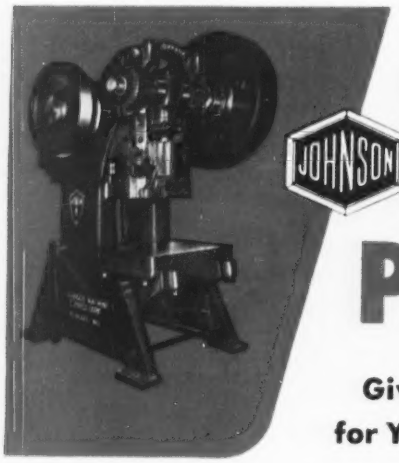
Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpes Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Thread

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.



Bonus Built
JOHNSON
POWER PRESSES

Gives You More Service for Your Production Dollar

- Non-Repeating Safety Clutch
- Double Spring Activated
- Unusual Versatility
- Larger Die Space
- Ample Power
- Adaptable to Metals, Plastic, etc.

WRITE FOR SPECIFICATION BULLETIN No. 54

for SPEED POWER ACCURACY
the HYDRA-SHEAR



Will increase your production to a new high. Will shear mild steel up to 10 gauge in three lengths: 6, 8 and 10 feet. Less curl and burring. No gears or clutch.

Johnson MACHINE and PRESS CORP.
620 WEST INDIANA AVENUE • ELKHART, INDIANA

Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GASKETS

Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic

Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.

GEAR CUTTING MACHINES, Bevel Gears (Generators)

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES Bevel Gears, Spiral

Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and Bevel Gears (Rotary Cutter)

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Waltham Machine Works, Newton St., Waltham, Mass.

GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing)

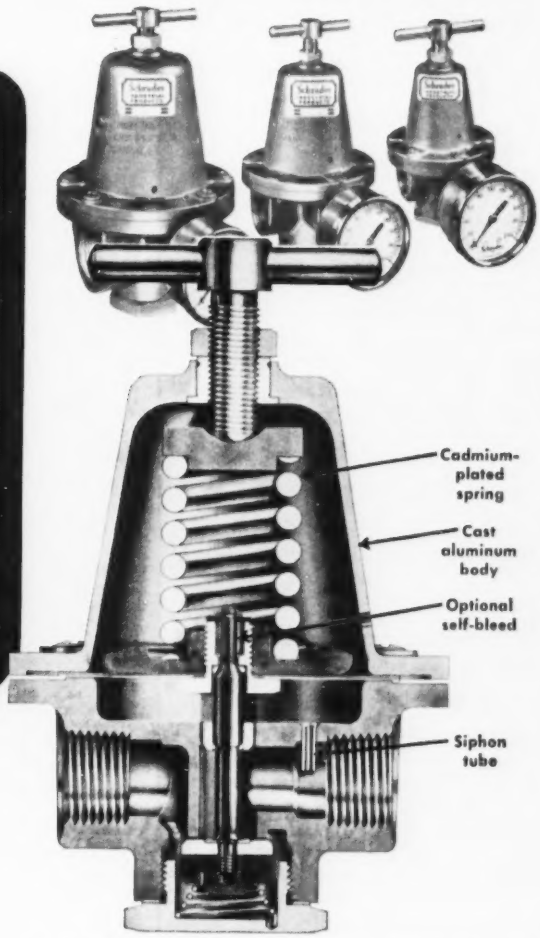
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.

(*Continued on page* 346)

For more information on products advertised, use Inquiry Card, page 247

The New Schrader Air Pressure Regulator

NOW... get
–maximum capacity
–fastest response
–minimum pressure drop



Large ports and straight-through design of these new Schrader Regulators give you maximum capacity with minimum pressure drop—and, at the same time, response that is almost immediate to changing demands.

Available in five sizes—¼, ⅜, ½, ¾, and 1 N.P.T., with and without gauge. Its normal range is 5-150 psi. A self-bleed feature for accurate pressure control is available if desired.

The lightweight aluminum body—heat-treated for strength—specially treated for corrosion resistance—means this new Schrader product can be mounted anywhere without special supports. Interior construction is of corrosion-resistant materials throughout. The diaphragm is a special material, noted for its strength and long life. All parts are replaceable, and service can be performed without special tools or removing the regulator from the line.

The regulator can be installed for flow from right to left . . . left to right . . . or vertically in either direction. It may be mounted right side up or inverted. The pressure gauge may be installed front or rear.

Once again, with these quick acting, high capacity regulators, Schrader demonstrates its leadership in compressed air equipment. Write today—or fill out the coupon—for more information on the new Schrader Regulators, or *any* air control devices.

Schrader
REG U S PAT OFF.

products
control the air

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings

Mail This Coupon Today

A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
454 Vanderbilt Avenue, Brooklyn 38, N. Y., Dept. T-10

Please send me details on the new Schrader Air Pressure Regulator.

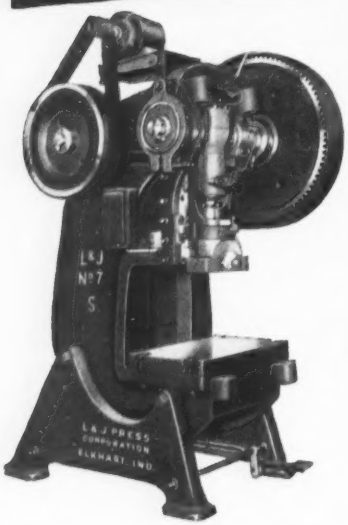
Name _____ Title _____

Company _____

Address _____ T-10

Improved

L&J PRESSES
Better-Built for Better Work



L&J Presses are producing work of better quality in larger volumes at reduced costs for numerous manufacturers. Here's why they do it:

- **Heavier, more rigid frames give minimum deflection for greater accuracy, longer die life at higher press speeds.**
- **Replaceable bronze bushings are standard equipment on two main and upper ram bearings.**
- **Roller bearings are standard in flywheel or main gear and backshaft mountings.**
- **Precision-scraped gibs of extra length for more permanent alignment and accuracy.**
- **Balanced designing plus precision manufacture for better performance and dependability.**

These are but a few of the reasons why L&J Presses can improve your press work and affect economies. 17 O.B.I. models—6 to 80 ton capacities—all available with air clutches. *Write for literature.*

L&J PRESS CORPORATION
1631 STERLING AVENUE
ELKHART, INDIANA

Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and Helical Gears (Shaper or Planer Type)
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.

GEAR CUTTING MACHINES, Worm and Worm Wheels
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt. (Straight and Hourglass Types).
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR FINISHING MACHINES
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR GRINDING MACHINES
Cosa Corp., 405 Lexington Ave., New York 17.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., Springfield, Mass.

GEAR HARDENING MACHINES
Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR MOTORS
See Speed Reducers.

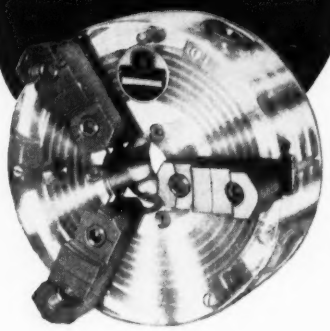
GEAR SHAVING MACHINES
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR TESTING MACHINERY
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEARS, CUT
Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Automotive Gear Works, Inc., Richmond, Ind.

(*Continued on page* 350)

NOW SEE what HORTON CHUCK EXTRAS can do for you!



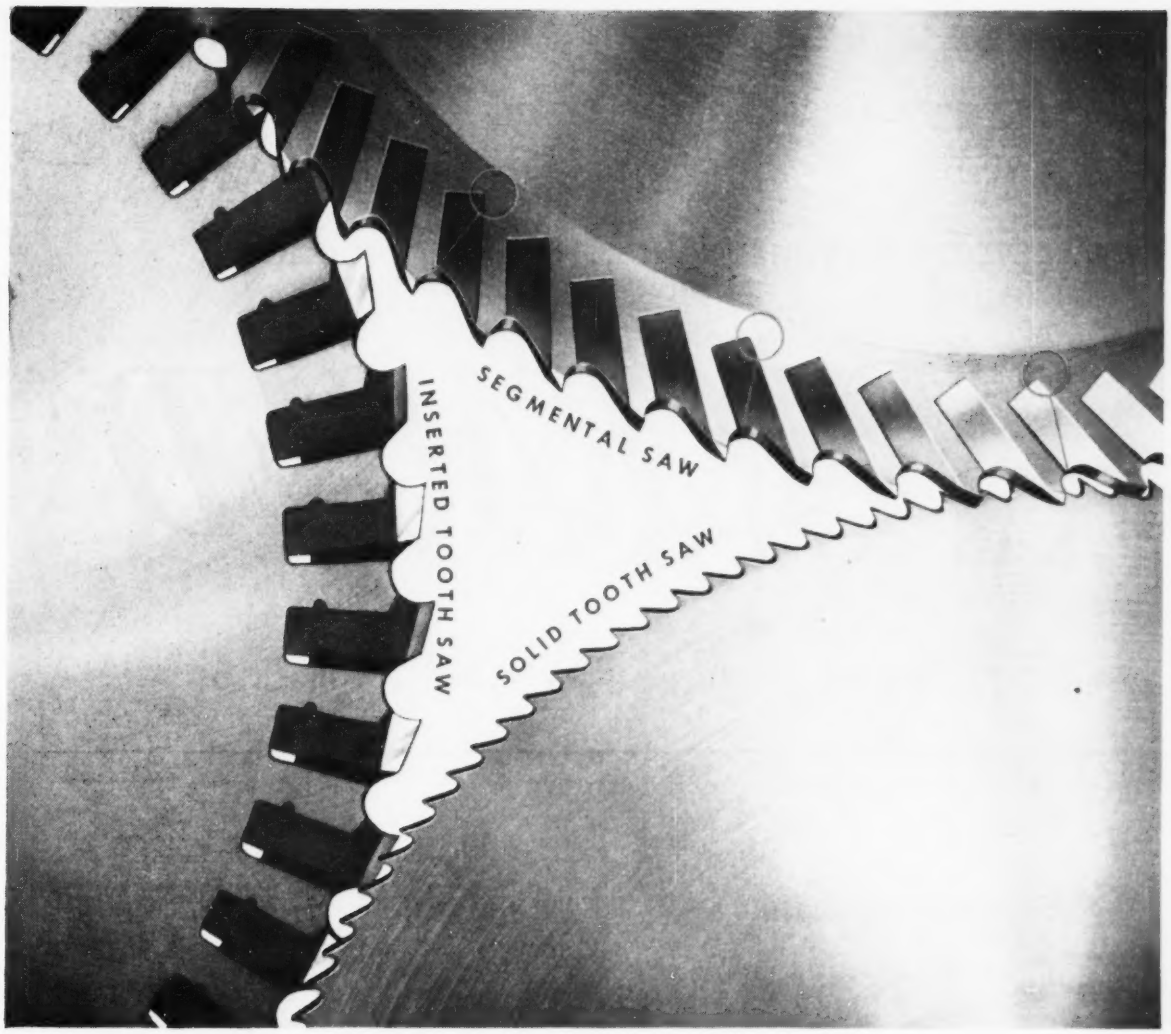
SEE the actual operation of a Horton Chuck with the new Plastic Demonstrators.

NOTICE the pilot hole construction of the independent chuck and the replaceable pinion bushings of the Scroll Universal Chuck — both Horton Exclusives.

ASK your Horton Distributor for a demonstration now. or write to . . .

HORTON CHUCK
Windsor Locks, Conn.

For more information on products advertised, use Inquiry Card, page 247



"Pick your Teeth!"

For the best saw-performance on your job... SIMONDS gives you a choice of *All 3 Types!*

INSERTED TOOTH: For heavy production cutting of all steel, brass, copper, and aluminum. Alternating square and beveled teeth "tri-vide" chips for easy cutting and clearance. Teeth can be easily replaced, singly or in complete sets, in your own plant by any average mechanic.

SOLID TOOTH: For general shop cut-off jobs . . . for use on smaller automatic cut-off machines and for cutting jobs where narrow kerf is important.

SEGMENTAL: For especially smooth cuts on production work. High Speed steel toothed segments are securely held in a tough alloy plate by a special tongue and groove design, have quick clearance for faster, freer cutting.

SIMONDS MAKES ALL THREE TYPES OF CIRCULAR METAL-CUTTING SAWS. So you can be sure that SIMONDS will give you *the right saw for your job* . . . for any type of machine. See your Simonds Distributor today, or write the nearest Simonds Office.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que.
Simonds Divisions: Simonds Steel Mill, Lockport, N. Y., Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

A NEW PAGE IN THE HISTORY OF INDUSTRIAL MACHINERY SUPPLY

Now...set up in your plant...ready to produce...

"PACKAGED*

● *Piecemeal purchasing is eliminated. Single-source buying enables you to get an integrated installation...in the shortest possible time...for the most attractive investment.*

This newly announced service of the Lake Erie Engineering Corporation is not an experiment. It is something we are doing more and more for leading plants throughout industry. It is a natural outgrowth of the ever increasing desire of our customers for our specialized services. As a result, we have the resources...the staff...the experience...to offer you the complete service described at the right. Call us. Then you will fully appreciate the advantages of a central responsible source. You will not be obligated...but you will be pleased.

INDUSTRIES SERVED BY LAKE ERIE ARE TYPIFIED BY THESE CUSTOMERS:

Allegheny-Ludlum Steel Co.
American Car & Foundry Co.
Bethlehem Steel Company
Boeing Airplane Company
The Dow Chemical Company
Eastman Kodak Company
The Electric Auto-Lite Co.
Ford Motor Company
Gates Rubber Company
Goodyear Tire & Rubber Co.
General Electric Company
International Harvester Co.
Molded Products Corp.
Mullins Mfg. Corp.
Norris-Thermador Corp.
Norton Company
Oak Ridge Atomic Laboratory
Pratt & Whitney Aircraft
Rheem Mfg. Company
A. O. Smith Corp.
Tappan Stove Company
Thompson Products, Inc.
Westinghouse Electric Corp.
Weyerhaeuser Timber Co.

LAKE ERIE PRODUCTION EQUIPMENT

HYDRAULIC PRESSES

For all forming operations ... forging including shells ...extrusion of all non-ferrous metals ...extrusion of steel, both hot and cold ...molding of abrasives, refractories, metal powder, plastics, rubber and wood ... and other production processes requiring the application of pressure.

DIE CASTING MACHINES

Die casting machines for aluminum, brass, zinc and magnesium, ..including trimming presses, die separating presses, furnaces and tools.

INSTALLATIONS"

of Lake Erie production equipment including tooling

THIS IS THE "PACKAGE"

The complete service or any part of it is available as required.

1. We discuss and explore your requirements with your management and engineers.
2. We submit a detailed proposal for your review and consideration.
3. We prepare an installation layout if one is needed.
4. We design, manufacture, and supply the basic machinery, tools and dies, conveyors, loading mechanisms, furnaces, or any other related auxiliaries.
5. Our field force installs or supervises the installation of the complete equipment in your plant.
6. We place the equipment in operation and train your supervisory and production personnel.
7. We assume responsibility for the satisfactory performance of the equipment as an integrated plant.

LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

Write or Call Us for Complete Details

LAKE ERIE ENGINEERING CORPORATION

170 Woodward Avenue, Buffalo 17, N. Y.

District Offices in New York • Chicago • Detroit • Pittsburgh

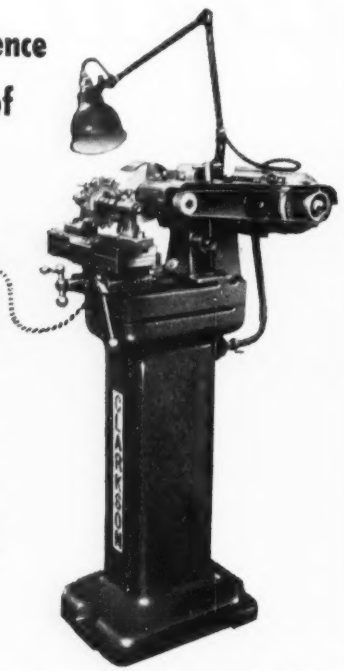
Representatives In All Foreign Countries

HYDRAULIC PRESSES • DIE CASTING MACHINES
ROLLING MILL AUXILIARY EQUIPMENT

LAKE ERIE®

Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Franke Gear Works, Inc., 1924 W. Columbia Ave., Chicago 26, Ill.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.
Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Ohio Gear Co., 1333 E. 179th St., Cleveland.
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia Pa.
Pittsburgh Gear Co., 2700 Smallman St., Pittsburgh, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

Backed By Years of Experience in the MANUFACTURE of CUTTING TOOLS...



THE CLARKSON CUTTER GRINDER

Simplicity . . . Speed . . . Economy are featured in the Clarkson Cutter Grinder . . . designed specifically for use in the manufacture of Clarkson Milling Cutters. All of the desirable features recognized as essential through years of experience, to the manufacture of cutting tools are incorporated into the Clarkson Cutter Grinder, yet it is low in cost, *right* for use in *your plant* for resharpening

- ★ END MILLS
- ★ SLOT DRILLS
- ★ REAMERS
- ★ WOODRUFF CUTTERS
- ★ T-SLOT CUTTERS
- ★ COUNTERBORES
- ★ COUNTERSINKS
- ★ SPOT FACING CUTTERS
- ★ SIDE AND FACE CUTTERS
- ★ CYLINDRICAL CUTTERS
- ★ FACE MILLS
- ★ ANGLE CUTTERS
- ★ and HOLLOW MILLS

Write today for FULL INFORMATION on the Clarkson Cutter Grinder . . .

Clarkson, Incorporated
320 Ontario Street
Toledo, Ohio
Gentlemen:
Please send full information and prices on the Clarkson Cutter Grinder.
NAME.....
COMPANY.....
STREET.....
CITY.....STATE.....

Clarkson INCORPORATED

DEDLOCK CHUCKS • AUTOLOCK CHUCKS • MILLING CUTTERS • CLARKSON CUTTER GRINDERS

320 Ontario St., Toledo, O.

GEARS, Rawhide and Non-Metallic

Amgears, Inc., 6633 W. 65th St., Chicago 38.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ohio Gear Co., 1333 E. 179th St., Cleveland.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Pittsburgh Gear Co., 2700 Smallman St., Pittsburgh, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schenectady 5, N. Y.
Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

GRADUATING MACHINES

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.

GREASE

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Sinclair Refining Co., 600 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

GRINDERS, Carbide Tool

See Grinding Mches, Carbide Tool

GRINDERS, Centerless

Van Norman Co., Springfield, Mass.

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N.Y.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.

GRINDERS, Oilstone, for Woodworking Tools

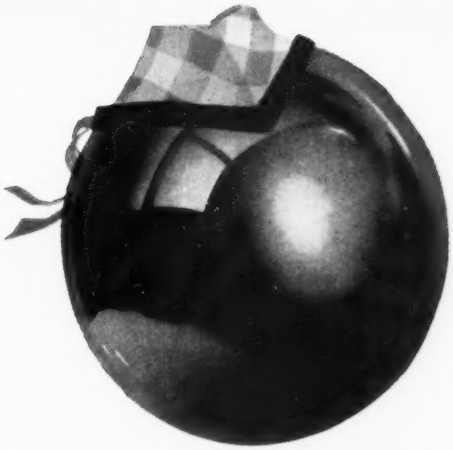
Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

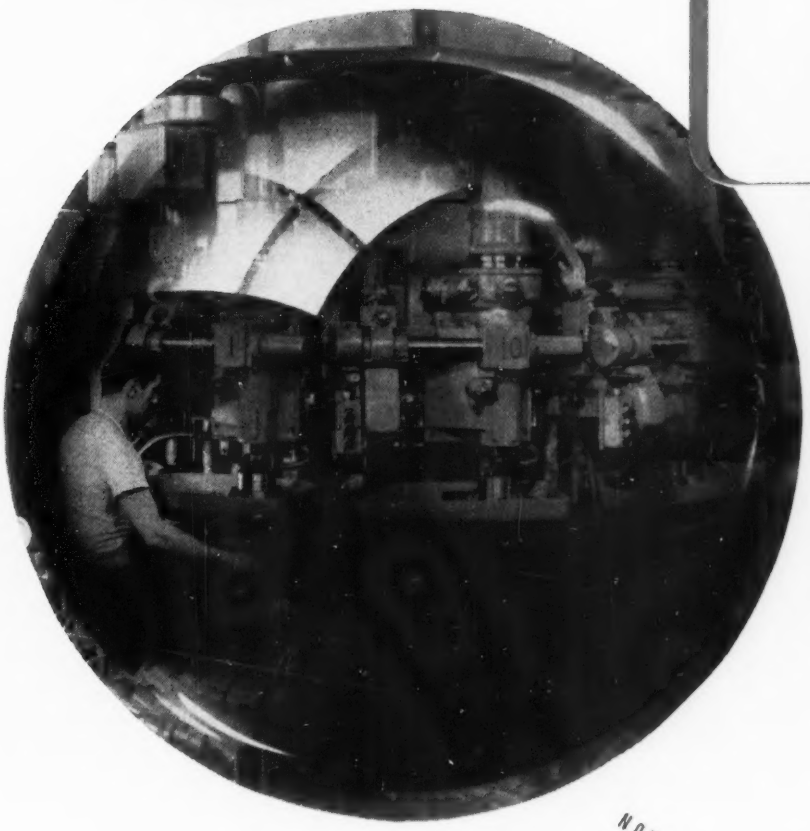
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Conn.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Thor Power Tool Co., Aurora, Ill.

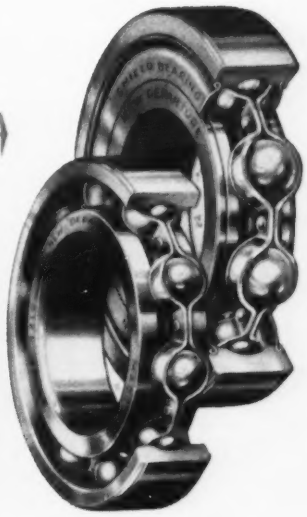
(Continued on page 352)

For more information on products advertised, use Inquiry Card, page 247



Money Savers in Motors and Machinery





NOTHING ROLLS LIKE A BALL



Cutting down on "down-time" is just one of the many contributions New Departure **ball** bearings have made to the machine age. For New Departures have proved themselves in countless applications, from electric motors to heavy industrial machinery. They take radial and thrust loads—or *any* combination . . . preserve accurate alignment of parts . . . reduce friction . . . require no adjustment for wear—and *virtually no maintenance!* Throughout industry, designers and engineers specify New Departure **ball** bearings for top performance.

NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT
Plants also in Meriden, Connecticut, and Sandusky, Ohio

GRINDERS, Portable Electric and Toolpost

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Millers Falls Co., Greenfield, Mass.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.

GRINDING FIXTURES

Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GRINDING MACHINES, Abrasive Belt

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, Ill.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Besly-Welles Corp., Beloit, Wis.
Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

GRINDING MACHINES, Broach

Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Chucking

Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Bullard Co., Brewster St., Bridgeport, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Landis Tool Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Van Norman Co., 2640 Main St., Springfield 7, Mass.

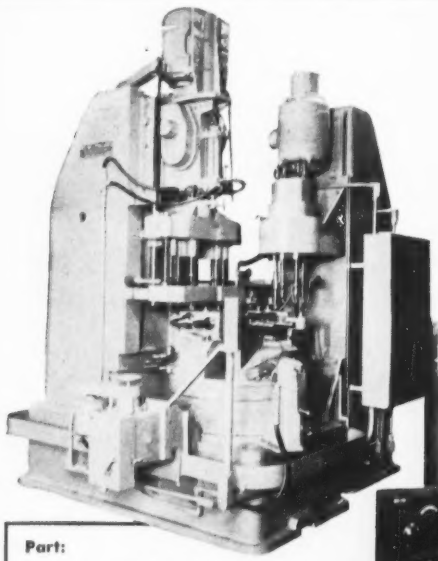
GRINDER MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn.
Landis Machine Co., Waynesboro, Pa.

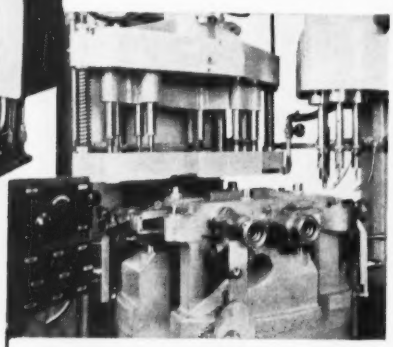
GRINDING MACHINES, Disc

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

(*Continued on page* 354)



MULTIPLY PROFITS BY MULTIPLE OPERATIONS



Part:

Steering gear housing. (Two different parts run on same machine with tool change only.)

Material: Malleable iron.

Operation: *Station 1*—Load and unload. *Station 2*—Drill (3) .368" holes; (1) .120" hole. *Station 3*—Combination spot face and chamfer (3) holes, drill (1) 23/32" hole for tapping. *Station 4*—Tap (3) 7/16"-14 NC-3 thread; tap 1/2"-14 NPSF thread.

Description: Millholland 4-station automatic index machine equipped with 4-station automatic index table, with 1 No. 5 Millholland Automatic Unit driven by 7-1/2 HP motor with 8-spindle ball bearing multiple head for drilling 5 holes and combination spot facing and chamfering 3 holes; 4-spindle tapper on right-hand column.

Operator loads part and pushes button initiating automatic cycle, unloads. Two parts machined at a time.

MILLHOLLAND ENGINEERED FOR MAXIMUM PRODUCTION

For special production machines, Millholland Automatic Units offer distinct advantages. These self-contained units, driven by individual motors, are readily adapted to a wide range of operations. Their full automatic cycle with interlocked controls permits several units to be grouped for simultaneous operations, or they can be mounted on other production machines and synchronized to perform additional operations. Millholland Automatic Units have proved themselves in 30 years of outstanding performance on all types of jobs. Get full details in Bulletin M-1.

W. K. MILLHOLLAND MACHINERY CO.
6402 Westfield Blvd., Indianapolis 2, Indiana

For more information on products advertised, use Inquiry Card, page 247

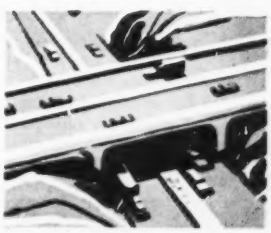


For tractors and implements . . .

for cars, trucks and busses . . .

NEW HYATT BARREL BEARING!

You're looking at a cross section of industry's newest find—*the bearing that's built with barrel-shaped rollers!* Developed by Hyatt, the Barrel Bearing is of true dual-purpose design—it takes load from any direction. But more than that, the Barrel Bearing is self-aligning—and misalignment of supporting parts cannot cause excessive wear, as it does with ordinary bearings. Now in volume production, this new bearing is in the newest trucks and busses, in farm, textile and construction equipment, and in many types of oil field machinery. In fact, if you own a new car there's a good chance that Barrel Bearings are in the wheels and differential.



for construction equipment and many types of new machinery.

HYATT ROLLER BEARINGS

STRAIGHT BARREL TAPER

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, N. J.

For more information on products advertised, use Inquiry Card, page 247

GRINDING MACHINES, Drill

Blake, Edward Co., 442 Cherry St., West Newton 65, Mass.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gailmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, Face

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Besly-Welles Corp., Beloit, Wis.
Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Mattison Machine Works, Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment

GRINDING MACHINES, Gap

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth

See Gear Grinding Machines



GRINDING MACHINES For Sharpening Cutters, Reamers, Hobs, Etc.

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Clarkson, Inc., 320 Ontario St., Toledo, O.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gailmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
land, Ohio.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, For Sharpening Turning and Planing Tools

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.
Waltham Machine Works, Newton St., Waltham, Mass.

GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, 32, Mich.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia Pa.

GRINDING MACHINES, Jig

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear Blade

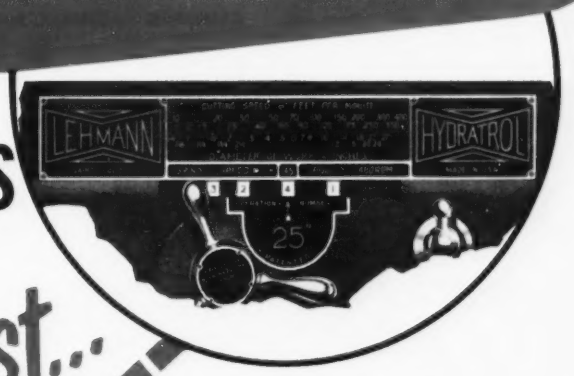
Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2,
Mattison Machine Works, Rockford, Ill.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

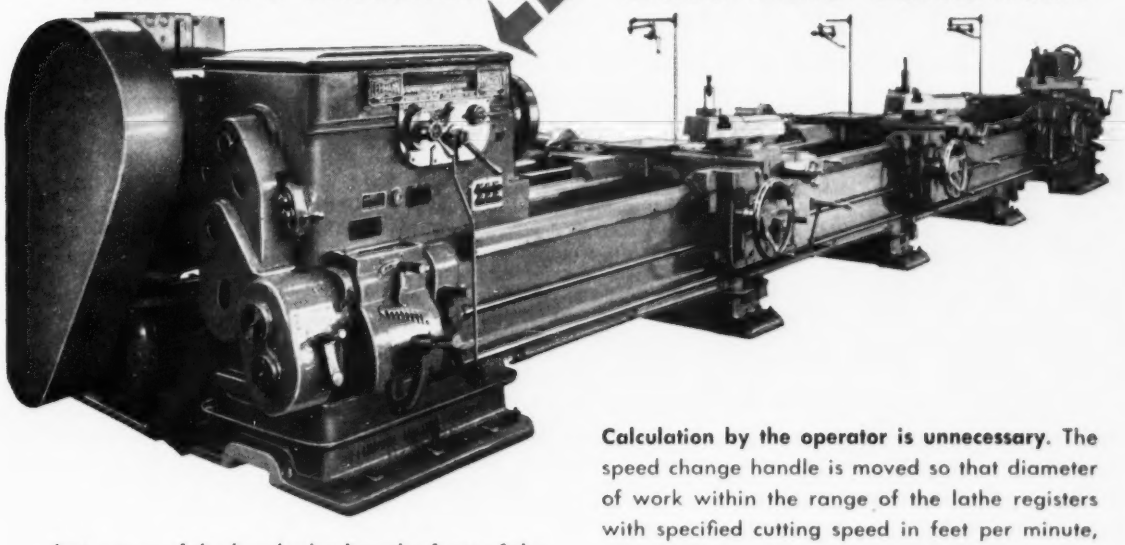
(*Continued on page* 356)

For more information on products advertised, use Inquiry Card, page 247

THE BIG HYDRATROL STORY:

16 Spindle Speeds *with only a* Twist of the Wrist... *with This Automatic Slide Rule Selection!*





Just a turn of the hand wheel on the front of the headstock of the LEHMANN Hydratrol Lathe gives you a speed change! An automatic slide rule, co-ordinated with the movement of the handle, shows spindle revolutions per minute and indicates a slide rule calculation of the cutting speeds in feet per minute.

Calculation by the operator is unnecessary. The speed change handle is moved so that diameter of work within the range of the lathe registers with specified cutting speed in feet per minute, and the lathe automatically makes the necessary change.

The rotary selector gives 16 forward and 8 reverse speeds. No need for intermediate stop; unnecessary to disengage the friction driving clutch to change speed.

Check These Other Important Advantages:

- **Safe in operation.**
- **Simplicity in construction and operation.**
- **Hydraulic friction clutches and hydraulic brakes, self-compensating.**
- **Automatic safety relay, for harmless and easy engagement of positive clutches when speeds are changed.**
- **Spindle release for chucking.**
- **Perfect, safety-control lubrication with filtered oil.**
- **Gears constantly in mesh.**

Write today for additional information or catalog—or—send prints for time-and-money-saving recommendation!

LEHMANN MACHINE COMPANY
GRAND at CHOUTEAU • ST. LOUIS 3, MO.

DIVISION OF NOVO ENGINE CO.

GRINDING MACHINES, Piston Ring

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Profile

Cleveland Grinding Machine Co., 1643 Eddy Rd., Cleveland 12, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Ex-Cello-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Ring Wheel Ball Race, Etc.

Besly-Welles Corp., Beloit, Wis.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Landis Tool Co., Waynesboro, Pa.
Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Radial,

Consolidated Mch. Tool Corp., Rochester, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

GRINDING MACHINES, Radius, Link

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Roll

Farrel-Birmingham Co., 25 Main St., Ansonia Conn.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Spline Shaft

Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Surface

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. (Rotary)
Besly-Welles Corp., Beloit, Wis.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co. 254 Laurel Ave., Des Plaines, Ill.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Gollmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reid Bros. Co., Inc., Beverly, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Thor Power Tool Co., Aurora, Ill.
Walker, O. S., Co., Inc., Worcester, Mass.

GRINDING MACHINES, Tap

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

GRINDING MACHINES, Thread

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Machine Co. (Centerless), Waynesboro, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine Wis.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Universal

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING WHEELS

Allison Co., Bridgeport, Conn.
Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Bay State Abrasive Products Co., Westboro, Mass.
Besly-Welles Corp., Beloit, Wis.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.

(Continued on page 358)

CUT... OPERATING — MAINTENANCE — SPOILAGE COSTS!

ON YOUR TAPPING JOBS!



NEW "TRU-GRIP" TAP HOLDER

The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders; eliminates "chewed" tap shanks. Holds tap true.

Procunier Tappers are the last word in economical, efficient, high speed tapping. More and more manufacturers are realizing that Procunier offers them the solution to their steadily rising production costs on many tapping operations. Only Procunier has the unique construction features that permit inexperienced operators to tap like experts. Procunier Tappers provide many extra hours of continuous, accurate tapping without frequent "down-time" interruptions. Procunier Tappers are producing more — with fewer rejections, fewer spoiled pieces and a minimum of broken taps.

There are many reasons for Procunier's superiority in the tapping industry. Here are just a few of the many remarkable mechanical improvements that only Procunier provides: new sensitive double cone friction clutch; soft cushioned action driving pressure; ballbearing equipped; heat treated gears; special balanced gear reversing mechanism; smaller-lighter more accurate tru-grip tap holder; and many others.

Write for FREE Brochure

Giving full particulars on the complete line of Procunier Tapping Machines. Learn how you can adapt them to your specific needs.



Procunier
Safety Chuck Company
16 S. CLINTON ST. CHICAGO 6, ILL.

PROCUNIER SAFETY CHUCK CO.
16 S. Clinton St., Chicago 6, Ill. Dept. 1

Gentlemen: Please send your illustrated brochure giving complete details, specifications and prices on the improved line of Procunier High Speed Tapping Heads.

Name.....
Address.....
City..... Zone..... State.....

For more information on products advertised, use Inquiry Card, page 247

PARTS LIKE THESE





are produced better . . . at lower cost *by* ALLIED'S COLD FORGING METHODS

Shown at the right in actual size is one of the many cold forged parts being produced by Allied.

By no other method could this particular part, or any of the other parts illustrated above, be manufactured as economically as by cold forging. However, to produce such parts requires ingenious engineering and production methods . . . and it is at Allied where you will find the best examples of cold forging ingenuity at work.

If you have need for parts similar to these . . . if you require tolerances as close as may be required for most machined parts . . . if you want maximum strength and durability in the parts produced . . . it will pay you to investigate what Allied can do for you. Send your part prints for quotation.

Other Allied Products

HARDENED AND PRECISION GROUND PARTS SHEET METAL DIES PRODUCED IN IRON, ALLITE (ZINC ALLOY) AND PLASTIC • R-B INTERCHANGEABLE PUNCHES AND DIES

STANDARD HEXAGON HEAD CAP SCREWS

Also produced by Allied are standard hexagon head cap screws. They are of uniformly high quality and are priced competitively. Your inquiry will receive prompt attention.



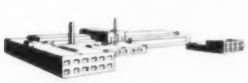
ALLIED PRODUCTS — PRECISION • EXPERIENCE • DEPENDABILITY

ALLIED PRODUCTS CORPORATION

Dept. D-16A 12619 Burt Road - Detroit 23, Michigan



PLANT 1
Detroit, Mich.



PLANT 2
Detroit, Mich.



PLANT 3
Hillsdale, Mich.



PLANT 4
Hillsdale, Mich.

Cincinnati Milling Machine Co., Grinding Wheels Div., Cincinnati Ohio.
Gardner Machine Co., (Surface Grinder) 414 E. Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

GROOVING Tools, Internal

Waldes Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

HAMMERS, Drop

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Chambersburg Engrg Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Morgan Engrg. Co., Alliance, Ohio.

HAMMERS, Forging Air

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Co., 200 "G" St., Wilmington 99, Del.

HAMMERS, Pneumatic

Chambersburg Engrg Co., Chambersburg, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Thor Power Tool Co., Aurora, Ill.

HAMMERS, Portable Electric

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md.
Millers Falls Co., Greenfield, Mass.

HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.

HAMMERS, Shaft

S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

HAMMERS, Soft

Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

HARDENING EQUIPMENT

Gleason Works, 1000 University Ave., Rochester, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

HARDENING MACHINES, Flame

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Gleason Works, 1000 University Ave., Rochester, N. Y.

HARDENING, Surface Treatment

Electrolizing Corp., 1505 East End Ave., Chicago Heights, Ill.

HARDNESS TESTING INSTRUMENTS

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Shore Instrument & Mfg. Co., Van Wyck Ave. and Carll St., Jamaica, N. Y.
Wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N. Y.

HEADING MACHINES

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

HEAT-TREATING EQUIPMENT

Ipsen Industries, Inc., 536 N. Madison, Rockford, Ill.

HOBBING MACHINES

See Gear Cutting Machines, Spur and Helical Gears (Hobbing), and Gear Cutting Machines, Worm and Worm Wheels.

HOBS

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Union Twist Drill Co., Athol, Mass.

HOIST HOOKS

Bethlehem Steel Co., Bethlehem, Pa.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

HOISTING AND CONVEYING EQUIPMENT

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

HOISTS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Thor Power Tool Co., Aurora, Ill.

HOISTS, Chain, Etc.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

HOISTS, Electric

Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

HONES

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Moline Tool Co., 102 20th St., Moline Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Sunnen Products Co. (Internal & External), 7900 Manchester Ave., St. Louis 17, Mo.

(Continued on page 360)

SHELDON
CHICAGO U. S. A.



More will be *profit* with a SHELDON

It actually costs less to do most turning jobs on a Sheldon Precision Lathe. Machine-tool investment is cut to a fraction. Power cost is materially reduced. Less experienced operators can operate Sheldons safely and efficiently. Even cost-loadings for plant—floor space, heat and light are lower because two Sheldons can often operate in the space occupied by one large lathe.

On most "everyday" jobs a Sheldon will actually turn out more pieces per hour too. With double V-belts to the spindle Sheldon lathes deliver enough power to take a healthy bite in direct drive, at really high speeds. Sheldon's "Zero Precision" Taper Roller Bearings permit work to the closest tolerances. Very seldom if ever are such extremely accurate bearings used in other lathes.

You will actually keep more as profit if you use Sheldon Lathes wherever possible.

Write for Catalog



SHELDON MACHINE CO., Inc. 4246 North Knox Ave., Chicago 41, Illinois

For more information on products advertised, use Inquiry Card, page 247

VARIABLE SPEED DRIVE NOW OPTIONAL ON... Logan 12" SWING LATHE At No Extra Cost



No. 2955-V
12" Swing Lathe with
Variable Speed Drive

Principal Variable Speed Drive Parts

1. Upper Section showing spindle V-pulley and Vari-Speed belt.
2. Vari-Speed Control
3. Lower section, showing Variable Speed V-Pulleys and Vari-Speed belts.

Belts are easily replaced. Spindle Speed Chart on gear guard provides clearly marked settings for various speeds.

SEE IT AT YOUR LOCAL LATHE DEALER'S, OR

Write for Information...

Full catalog descriptions and price information on request. WRITE TODAY TO

Provides Infinite Spindle Speeds, 38 to 1575 rpm.

The rugged, accurate Logan 12" Lathe is now available with either standard V-belt Drive, or the new Logan Variable Speed Drive, *at the same economical price*. Where the work handled requires a variety of spindle speeds, the time-saving speed correction of the Logan Variable Speed Drive definitely reduces costs. On large diameter facing, for example, the optimum surface speed is maintained by simply turning the Variable Speed Control Handle as the cutter goes into the work. No need to stop the lathe. No belt shifting. One control handle provides infinite spindle speeds between 38 and 1575 rpm, with all speed changes made *while the lathe is running*. This new optional feature, together with such standard Logan advantages as the massively proportioned ball bearing spindle; the balanced bed with the two V-ways and two flat ways precision ground; and the convenient new carriage . . . make the 12" Logan the lathe for profitable work.

Brief Specifications of Logan 12" Lathes

Swing over bed and saddle wings, 12"... Center Distances, 23" and 35"... Turret Lathes Models have 43" bed length... 1⅜" spindle hole... 1" collet capacity... 16 standard V-belt drive spindle speeds, 35 to 1230 rpm... Variable Speed Drive Models, infinite spindle speeds from 38 to 1575 rpm.

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

LOGAN ENGINEERING CO.

Lawrence and Lamon Avenues • Chicago 30, Illinois

HONING MACHINES, Internal (Cylinder)

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Moline Tool Co. 102 20th St., Moline, Ill.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sunnen Products Co., 7900 Manchester Ave., St. Louis 17, Mo.
Superior Hone Corp., 1623 Elreno St., Elkhart, Ind.

HONING MACHINES, External

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.

HONING TOOLS AND FIXTURES

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Sunnen Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

HOSE, Leather, Rubber, Metallic, Etc.

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

HYDRAULIC MACHINERY Tools and equipment

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Corp., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Denison Engrg. Co. 1160 Dublin St., Columbus 16, Ohio.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St. Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit Mich.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

HYDRAULIC POWER UNITS OR TOOL HEADS

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, John S., Corp., Rockford, Ill.
Barnes W. F. & John Co., 201 S. Waterford St., Rockford, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Rivett Lathe & Grinder, Inc., Brighton, Boston, 35, Mass.
Turchon Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

INDEXING AND SPACING EQUIPMENT

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Bellows Co., 230 W. Market St., Akron, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
South Bend Lathe Works Inc., 425 E. Madison St., South Bend, Ind.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

INDICATORS, Dial

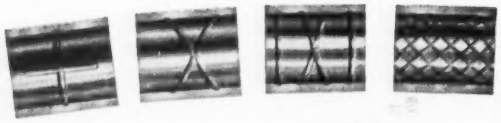
Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp, P. O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDICATORS, Speed

Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

(*Continued on page 362*)

High Speed
CONTINUOUS OIL GROOVING



500
PIECES PER HOUR!

High-production and economical operation are the features of the WICACO CONTINUOUS OIL GROOVER . . . capable of completing as many as 500 grooved pieces per hour in routine practice—even with unskilled labor!

The operator loads and unloads the work **without stopping the Machine** — a valuable time-saving advantage made possible by the WICACO upright construction of the spindle and stationary chuck. Feed-lever automatically returns to neutral position when cutting tool reaches its proper depth. The spindle—not the chuck—revolves, permitting fast and convenient grooving of a variety of larger and irregular work. Maximum depth of groove 7/32", maximum width 3/8", grooves may be cut in work from 1/4" I.D. to 4 1/2" I.D.; standard chuck holds work to 4½" O.D.; stroke of spindle from 0" to 7"; floor space 24" dia.; weight of machine about 950 lbs.



Send us sample bearings to cut to specifications. We will return them, properly grooved, with a record of the time required and a cost-estimate. No obligation. Or, write for detailed, well-illustrated Bulletin.

WICACO

SINCE 1868

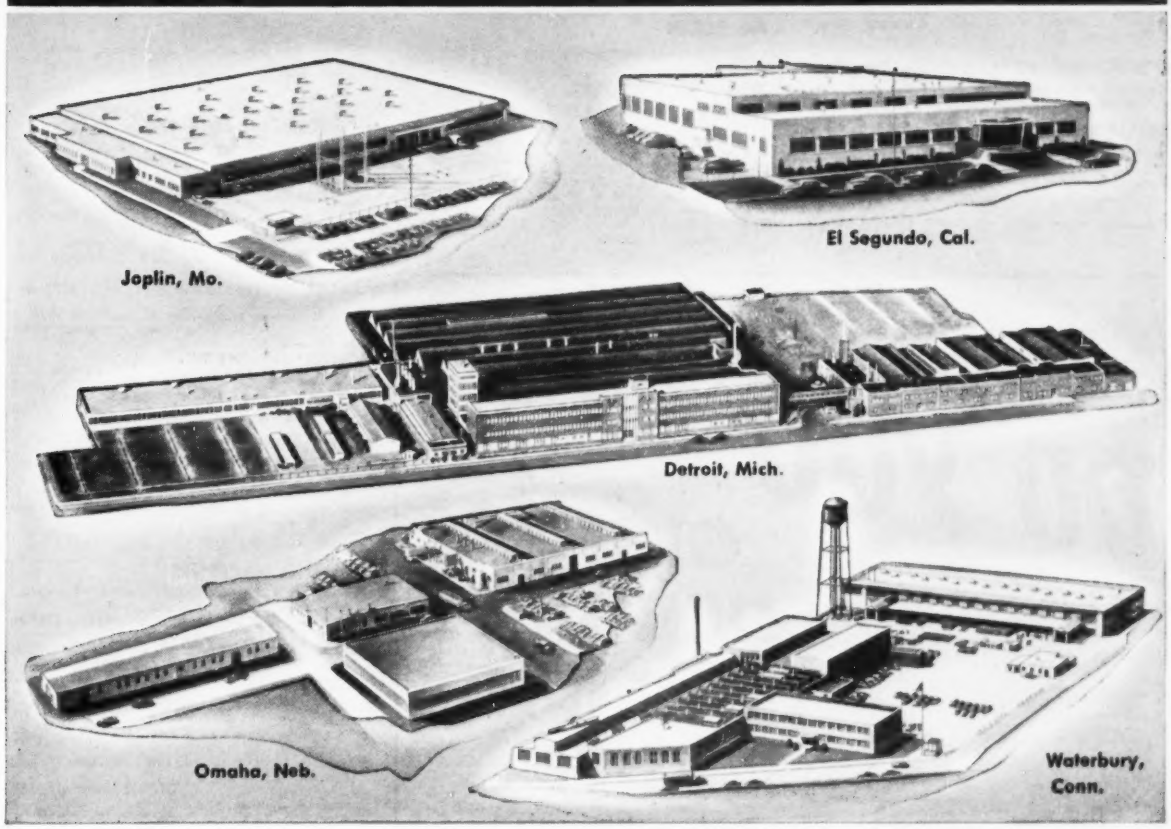
THE WICACO MACHINE CORPORATION

WAYNE JUNCTION PHILADELPHIA 44, PA.

For more information on products advertised, use Inquiry Card, page 247

ONE OF A SERIES

You Get Many Benefits by Specifying VICKERS® Hydraulics



Unmatched Facilities

For Hydraulics Development, Design, Manufacturing and Application

In resources for research, design, development, manufacturing and application, Vickers is unmatched in the hydraulics field. The five plants shown above employ more than six thousand people. These plants are strategically located to best serve the diversified industries that use Vickers Hydraulics.

The large scope of these operations makes it economically practicable for Vickers to develop facilities that would be impossible under other circumstances. As a result, you get more for your money when you buy Vickers Hydraulic Equipment.

VICKERS
Incorporated
DIVISION OF THE SPERRY CORPORATION
1403 OAKMAN BLVD. • DETROIT 32, MICH.
Application Engineering Offices: ATLANTA • CHICAGO (Metropolitan) • CINCINNATI • CLEVELAND • DETROIT HOUSTON • LOS ANGELES (Metropolitan) • NEW YORK (Metropolitan) • PHILADELPHIA • PITTSBURGH • ROCHESTER ROCKFORD • SEATTLE • TULSA • WASHINGTON • WORCESTER

6627

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

INDICATORS, Test

Ames, B. C. Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDUCTION HEATING EQUIPMENT

General Electric Co., Schenectady, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

INSPECTION INSTRUMENTS, Visual

American Cystoscope Makers, Inc., 1241 Lafayette Ave., New York, N. Y.

INTENSIFIERS, Hydraulic

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Baldwin-Lima-Hamilton Corp., Philadelphia 42.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

JACKS, Planer

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Northwestern Tool & Engrg. Co., 117 Hollier Dayton, Ohio.

JIG BORER

See Boring Machines, Jig.

JIGS AND FIXTURES

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bath, Cyril Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, Ill.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Northwestern Tool & Engrg. Co., 117 Hollier Dayton Ohio.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsacket, R. I.

JOINTS

See Fittings, Hydraulic, Pneumatic, Etc.

KEYSEATERS

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Co., Rochester, N. Y.
Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Mitts & Merrill, 68 Holden St., Saginow Mich.
Morton Mfg. Co., Muskegon Heights, Mich.

KNURL HOLDERS

Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.

KNURLING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago Ill.
Pratt & Whitney, West Hartford 1, Conn.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

LAPPING MACHINES

Barnes Drill Co. (Straight Line or Rotating,) 814 Chestnut St., Rockford, Ill.
Cincinnati Grinders, Inc. (Centerless), Cincinnati, Ohio.
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill. (Lapmaster Div.).
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

LAPPING PLATES, Hand

Crane Packing Co., 1800 Cuyler Ave., Chicago.

LATHE AND GRINDING DOGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

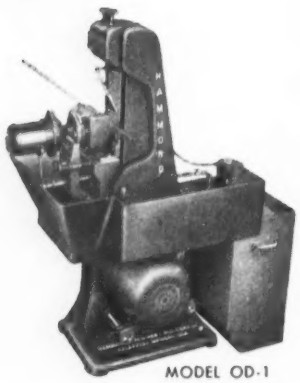
LATHE ATTACHMENTS

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hendey Machine Co., Inc., Torrington, Conn.
Jones & Lamson Mch., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

(*Continued on page* 364)

DO YOU

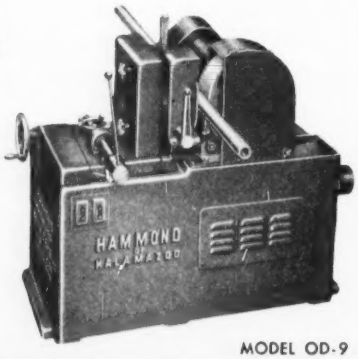
GRIND
DEBURR
POLISH
BUFF



MODEL OD-1

TUBES, RODS, BARS AND OTHER CYLINDRICAL SHAPES...PLUNGE CUT OR THROUGH-FEED





MODEL OD-9

SEND SAMPLES...

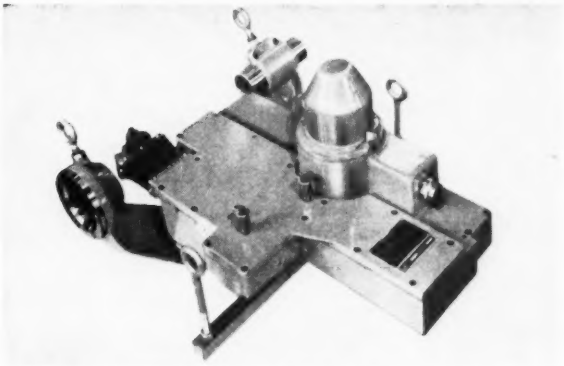
For a Complete Engineering Report on Your Work. Send Us One Finished and Several Rough Samples. No Obligation.

Hammond Machinery Builders INC

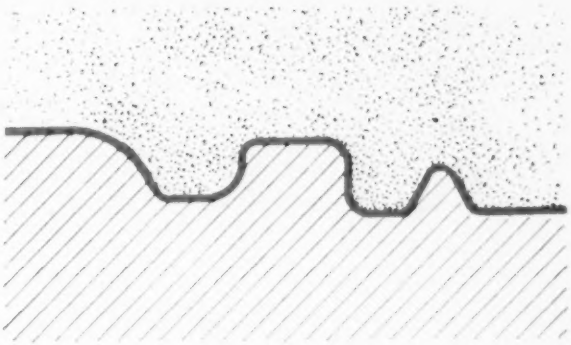
1619 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

For more information on products advertised, use Inquiry Card, page 247

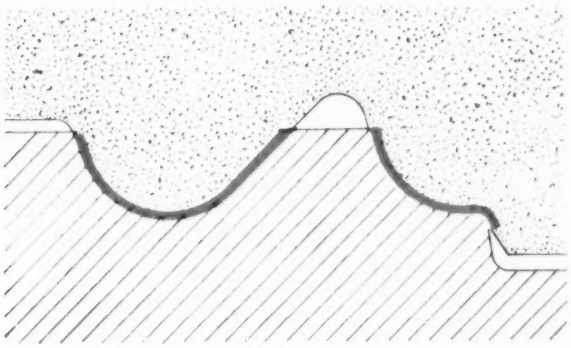
Key to Accurate, Fast Contour Grinding . . . A HOGLUND Automatic or Manual Dresser



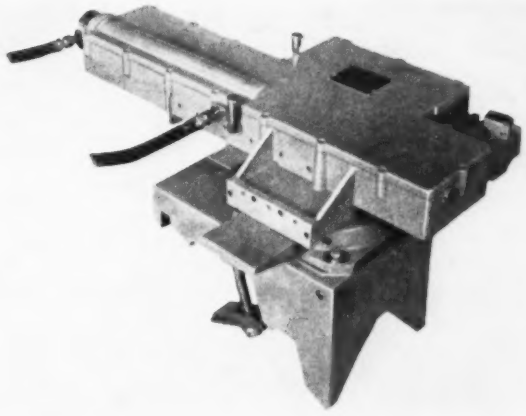
Automatic Electrically Operated Dresser, **Model 40, designed to support between the centers of the grinder under the same conditions as the work piece is supported. Especially suited for grinding machines not having space anywhere else for mounting the dresser.**



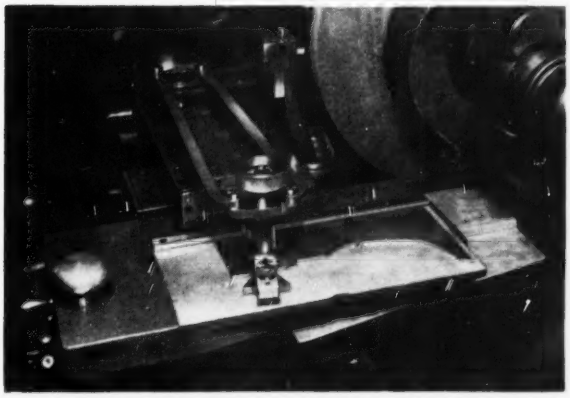
Turbine Shaft Profile **dressed with Hoglund Model 40 Dresser on grinder having just sufficient capacity to hold length of the shaft. Would be extremely difficult to dress without the Hoglund Dresser.**



Double Ball Race Form **on large propeller shaft plunge ground to .0001" tolerance for preload assembly of propeller in hub. Very difficult to dress into the grinding wheel without the Hoglund Model 35 Dresser.**



Automatic Hydraulically Operated Dresser, **Hoglund Model 35, used on large cylindrical grinder for dressing double ball race form and other contours to .0001" tolerance on 30" diameter, 3½" wide wheels.**



Manually Operated Contour Wheel Dresser **for flat table universal cylindrical grinders, operated from template enlarged 10 times or 5 times the size of the finished profile. Hoglund Model KB 14-1 or KB 14-2.**

We make over 50 different types of contour wheel dressers covering all types of grinders —Surface Grinders, Cylindrical Grinders both plain and universal, Internal Grinders, Special Double Wheel-Head Grinders, Centerless Grinders, etc.

Send us your blueprints and have us submit our recommendations.

HOGLUND
ENGINEERING & MANUFACTURING CO.
Berkeley Heights New Jersey

For more information on products advertised, use Inquiry Card, page 247

The Answer to YOUR HONING PROBLEMS



Here's why they're switching to the

SUPERIOR HONING MACHINE

Model "J"

There IS a difference in honing machines. Superior gives you all the features you want. It's the most versatile and economical bench-type honing machine made. For instance, how many spindle speeds would you like? The Superior gives you infinitely variable speeds from 400 to 1000 r.p.m. AND without changing belts. Talk about ease and speed of changing mandrels and stones—no tools are needed! All stones are ground to size.



With the Superior you can hone over keyways, spline gears and most broken surfaces. How big is it? 13" x 16½" x 25" high. It weighs only 125 pounds.

Use a Superior honing machine. You'll be quick to see its many advantages and you will be satisfied with no other; for after all arguments are exhausted, performance is the test.

Use coupon today to get free literature

SUPERIOR HONE CORP.

1623 Elreno Street Elkhart, Indiana

Please send free catalog on Superior Honing Machines

Name .....

Firm .....

Street .....

City & State .....

Name of Supplier .....

Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sidney Machine Tool Co., Sidney, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHE CONVERTER

Master Mfg. Co., Hutchinson, Kansas.

LATHES, Automatic

Bullard Co., Brewster St., Bridgeport 2, Conn.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co., Kensington, Conn.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St. Sidney, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Axle

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Seneca Falls, Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Bench

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Boring

Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Double-End

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford Ill.

LATHES, Duplicating

H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Engine and Toolroom

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hendey Machine Co., Inc., Torrington, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Logan Engrg. Co., 4901 W. Lawrence Ave., Chicago 30, Ill.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Machine Tool Corp., Sidney, Ohio.
Simmons Machine Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.

LATHES, Gap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Gun

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Seneca Falls Mch. Co., Seneca Falls, N. Y.

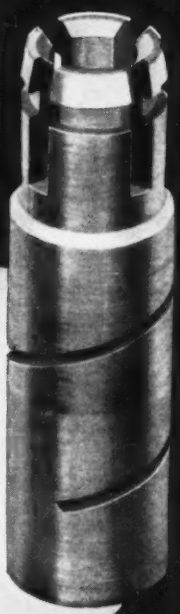
LATHES, Hollow Spindle

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

(*Continued on page* 366)

For more information on products advertised, use Inquiry Card, page 247

HOW A BIG NAME MANUFACTURER SAVES 80% IN MAN HOURS —PLUS



JOB FACTS:

SIZE—½" diameter, 1½" long

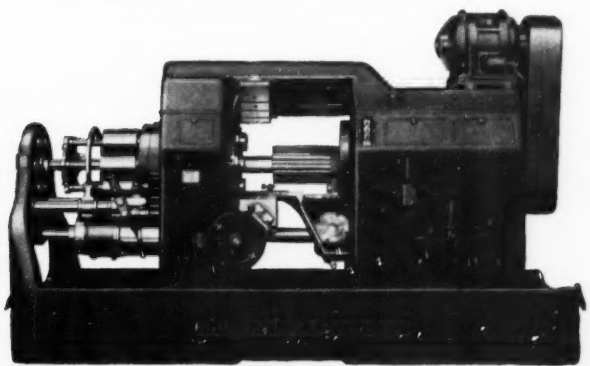
MATERIAL—C-1137 Steel

OPERATIONS—13 including 2 spindle stoppers and pick-off attachment

MACH. TIME—13 seconds

—makes this precision finished steel spindle, completes its 13 different operations in 13 seconds on a 9-16" Acme-Gridley Bar Automatic.

By previous methods the three major screw machine operations required 3 different machines—one for blanking the part, another for milling the spiral oil groove, another for double slotting the end.



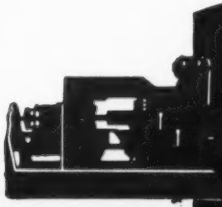
ACME-GRIDLEY 6 SPINDLE BAR AUTOMATIC
Built in 8 different chuck capacities—from 9/16 to 4"

The difference in time for the job—in man hours alone—results in a labor saving of 80%. Value of floor space, cost of extra secondary operation machines, and extra overhead are not figured in.

What "plus" factors? All burrs at oil groove, in slots, on the radiused cut off, are removed on the automatic, by precision shaving the piece all over. The slots are held within .005 of a 90° center line and the collet radius to .0005 concentricity. This single setup eliminates the errors that creep in when it is necessary to rechuck the job, minimizes inspection and scrap loss, insures precise duplication, but adds nothing to the machining time.

At a distance we can demonstrate superior performance only by such examples of completely controlled cycle time and ingenious tooling combinations that apply also to your bar machine work—to save you man hours, reduce your costs or give you a better product. So again we say—

Industry can't do **TODAY'S** job—with **YESTERDAY'S** tools
. . . and make a profit **TOMORROW**



The NATIONAL ACME COMPANY
170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing.



● Careful testing at Chicago-Latrobe gives accurate appraisal of the number of holes a DOUBLE-CIRCLE Drill will cut before sharpening becomes necessary. Constant effort by Chicago-Latrobe engineers steadily increases performance. High standards of quality and careful inspection of every manufacturing operation is maintained to meet close tolerance specifications...to give you LONGER CUTTING MILEAGE... and less shut-down time.

A variety of types and sizes of DOUBLE-CIRCLE Drills meet every requirement... General Purpose... Heavy Duty... Fast Spiral... Slow Spiral ...Bright Spiral... Carbide Tipped and Specials. Write for booklet No. 179 for description.

AVAILABLE AT YOUR DISTRIBUTORS

DOUBLE CIRCLE TOOLS

CHICAGO-LATROBE

417 W. ONTARIO ST. CHICAGO 10

DRILLS • REAMERS • COUNTERSINKS • COUNTERBORES • CARBIDE TOOLS • SPECIAL TOOLS

LATHES, Manufacturing Type

Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Spinning

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Ferracute Machine Co., Bridgeton, N. J.

LATHES, Toolroom

See Lathes, Engine and Toolroom.

LATHES, Turret

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Brothers, Inc., (Bench or Cabinet Mounting), 1418 College Ave., Elmira, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Potter & Johnston Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Vertical Turret

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

LAYOUT FLUID

Dykem Co., 2303 P. North 11th St., St. Louis 6, Mo.

LEVELS

Bullard Co., Brewster St., Bridgeport 2, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

LOCKNUTS

Link-Belt Co. (For Positioning Bearings), 519 N. Holmes Ave., Indianapolis 6, Ind.

LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 120 Lockwood St., Newark 5, N. J.
Shear-Speed Chem. Prod. Div., Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Sinclair Refining Co., 600 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

LUBRICATING SYSTEMS

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Farvel Corp., 3249 E. 80th St., Cleveland, Ohio.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

(*Continued on page 370*)

For more information on products advertised, use Inquiry Card, page 247

$40,000 GAMBLE

– for a $32 pot

CASE: Four years ago we told a manufacturer of continuously-operated process machinery we could supply gears that would practically eliminate the possibility of gear failures—for $32 more per machine. The machines sell for approximately $40,000.

We couldn't convince him. He took the gamble—used the cheaper gears. Four years later, two sets of these gears failed—within one week. The result: extreme trouble and expense—and a manufacturer frantic with the prospect of more failures in the machines built since.

Are *your* gear tolerances adequate? Would you like to be *sure*—at no cost? Call us in. We will reassure you—or show conclusively that you need better gears for proper protection. *Sier-Bath Gear & Pump Co., Inc., Dept. G, 9248 Hudson Blvd., North Bergen, N. J.*

Sier-Bath

PRECISION GEARS
Proven accuracy where required!

Write for bulletin: "Gear Errors are Costly!"

Also mfrs. of Rotary Pumps . . . Flexible Gear Couplings.
Founded 1905. Member A.G.M.A.

production begins with



Columbus Die-Tool

It takes the right machinery to build your product right! Columbus Die-Tool individually designs and builds tools, dies, and special machinery to produce your product alone. This gives you the advantages of lower operating cost, greater production and a higher quality product.

Let Columbus Die-Tool's more than 46 years of designing and engineering experience go to work for you. Contact CDT today about your special die, tool and machinery requirements.

Columbus Die-Tool
AND MACHINE COMPANY
P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

For more information on products advertised, use Inquiry Card, page 247

ANNOUNCING the new BRYANT



BRYANT proudly introduces the newest member of the Bryant family of precision machines — the Bryant 998 Boring Machine — a production machine for precision boring, drilling, turning, facing, grooving and contour turning and boring where fine finish and rapid production are desired.

The Bryant 998 can be tooled either as a single purpose machine for quantity production or for miscellaneous work on small lots. Because it is all-mechanical, its cycle is positive and constant.

Smooth, uniform motion of the table and freedom from vibration, so essential to generating a fine finish with a single point tool, are assured by the 998. Its bed, bridge, heads and table are Meehanite castings. The table moves on preloaded ball bearing slide bars and is mechanically actuated by a simple cam and lever unit. Cam and change gears are easily accessible for changing either the length of stroke or the rate of travel. The motors for driving the cam and the boring heads are mounted in an accessible cavity inside the bed, thus keeping floor space to a minimum. This cavity is fan ventilated.

Ample fixture mounting surface is provided by the table, which measures 17½″ x 22″. The table has three ½″ T-slots, and will accommodate a wide variety of fixtures. Machined setup pads are provided on the bridge for ease in locating fixtures.

The design of the Bryant 998 takes full advantage of standard purchased parts. Brakes, motors, air cylinder, bearings, pneumatic follower system, lubrication hoses and all electrical apparatus are stock items. Either low or high pressure coolant systems are available. All electrical equipment conforms to J. I. C. standards.

BORING MACHINE

Design

- The bed, bridge, table and heads are normalized Meehanite castings.
- The cam actuated table moves on preloaded ball slide bars.
- The cam is hardened and ground.
- The boring head spindles rotate in preloaded super-precision ball bearings. A graduated spindle nose and eccentric bushing for tool setting are standard.
- An air cylinder opposes the work table motion directly with constant pressure and keeps the cam follower roll and the cam always in contact.
- The boring head drive is completely accessible and is designed for long life.
- The cam drive assembly is protected by a torque limiting clutch.
- Cycle time is controlled by precision change gears in the cam drive gear box.
- An ample pad is provided at the rear of the machine for mounting accessory equipment.

Operation

- Push button controls are conveniently located on a panel at the front of the machine.
- Cycle can be manual, semi-automatic or fully automatic.
- An emergency stop button will instantaneously interrupt the cycle.
- Jog buttons are located on both the front and the rear of the machine for setup purposes.
- Machined setup pads are provided on the bridge for ease in locating fixtures.

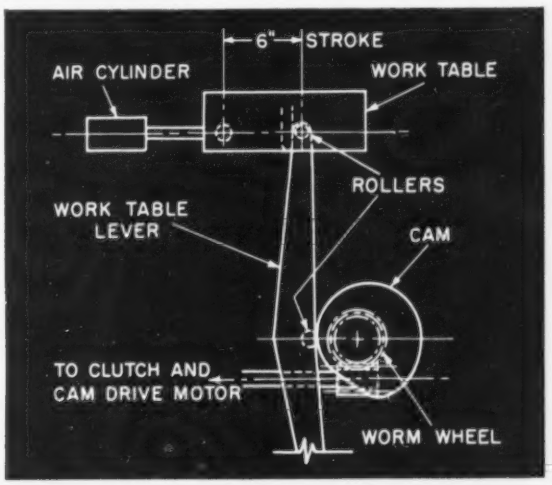
Maintenance

- Maintenance is necessary at only three points: two grease fittings on the cam follower assembly and cleaning and lubricating of the filter-lubricator unit in the pneumatic system.
- The ball slide table is grease sealed.
- Gear box has its own closed lubrication system.
- The boring head bearings are permanently grease sealed.
- The cam is easily accessible for changing the table stroke. It is taper mounted and keyed to the drive shaft to ensure ease of changing and accurate mounting.
- The change gears are enclosed in their own wet sump, splash lubrication system.
- Brakes, motors, air cylinder, bearings, pneumatic follower system, lubrication hoses and all electrical apparatus are standard purchased parts.

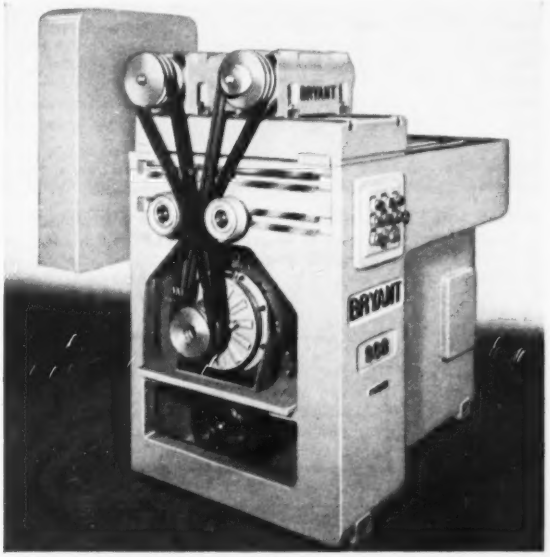
Write today for complete information and specifications!



Smooth response of the table is ensured by the special Bryant slide bar design. Each bearing is a hardened steel sleeve containing numerous ⅜" diameter preloaded balls. This provides a metal-to-metal contact which resists forces in all directions and transmits stresses directly to the bed.



The table is actuated by an inexpensive, quick-change cam working through a follower and lever arm. An air cylinder opposes the work table motion, keeping the cam follower and the cam always in contact to completely eliminate back-lash and jump.



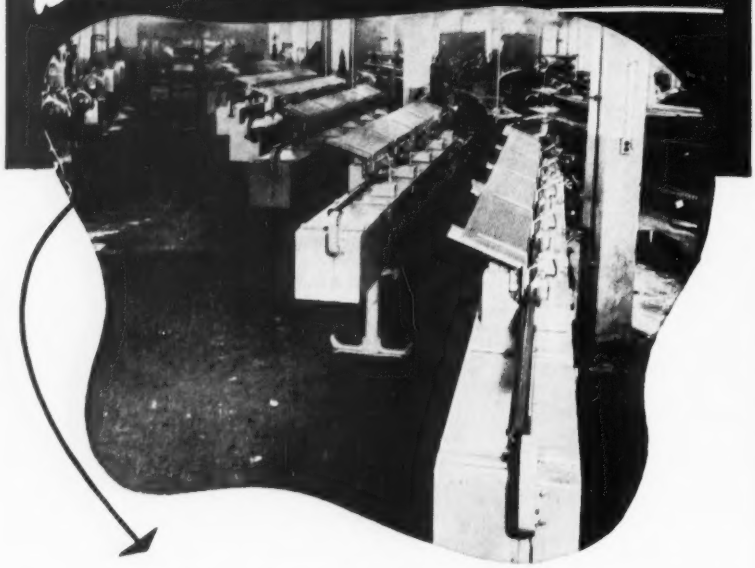
Cam drive and boring head motors are mounted in a well ventilated cavity in the bed.

BRYANT Chucking Grinder Company
Springfield, Vermont, U. S. A.

Internal Grinders, Internal & External Thread Gages, Granite Surface Plates, Boring Machines

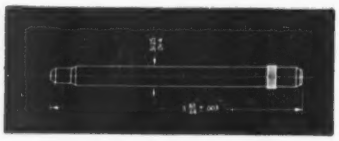
For more information on products advertised, use Inquiry Card, page 247

LIPE AUTOMATIC MAGAZINE LOADING BAR FEEDS *Doubled* PRODUCTION!

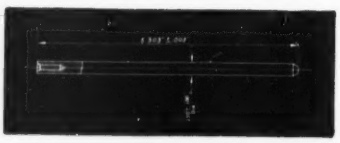


The machined worm wheel shaft and agitator rod shown below are typical of the many parts turned out on a bank of seven screw machines equipped with Lipe AML Bar Feeds at Hamilton Beach Division, Scovill Mfg. Co., Racine, Wis., manufacturers of food mixers, vacuum cleaners, hair dryers and other motorized appliances.

No lost time in loading and hand feeding! . . . No scratching of high-finish stock! . . . No idle operation of screw machines! . . . Maximum production capacity fully maintained!



Long worm wheel shaft .3125" dia. machined from piston rod finish, cold-drawn steel. When the Lipe AML Bar Feed automatically loaded and fed the stock to a Model 2G B&S, *production increased 100%* over conventional loading operation.



Agitator rod .250" dia. machined from S.A.E. #1112 Bessemer wire. When the Lipe AML Bar Feed automatically loaded and fed the stock to a Model 00G B&S, *production increased 100%* over conventional loading operation.

On job after job there is proof—like these examples from a typical four-week production run—that Lipe Automatic Bar Feeds insure big production gains, BECAUSE:

- **Stock is fed to screw machines all the time . . . not dependent on operator.**
- **Pressure constantly behind stock.**
- **Eliminates feed fingers.**
- **Avoids multiple feed finger feedouts.**
- **Model AML gives maximum output of machine . . . no "cutting air."**
- **Saves changeover set-up time.**

Get full details on how this machine will increase production and save you money. It's today's big advancement in screw machine stock feeding. Our engineers will gladly study your problem . . . no obligation.

Lipe-ROLLWAY CORPORATION
Manufacturers of Automotive Clutches and Machine Tools
Syracuse 1, N. Y.

MACHINISTS' SMALL TOOLS
See Calipers, Hammers, Wrenches, Drills, Taps, Etc.

MANDRELS
See Arbors and Mandrels.

MARKING MACHINES AND DEVICES
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.

MASKS, Painting
Conforming Matrix Corp., 342 Toledo Factories Bldg., Toledo 2, Ohio.

MEASURING MACHINES AND INSTRUMENTS, Precision
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MEASURING WIRES, THREAD, SPLINE AND GEAR
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

METAL, Bearings
See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.

METERS
See Recording Instruments.

MICROMETERS
Ames, B. C., Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MICROSCOPES, Toolmakers
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

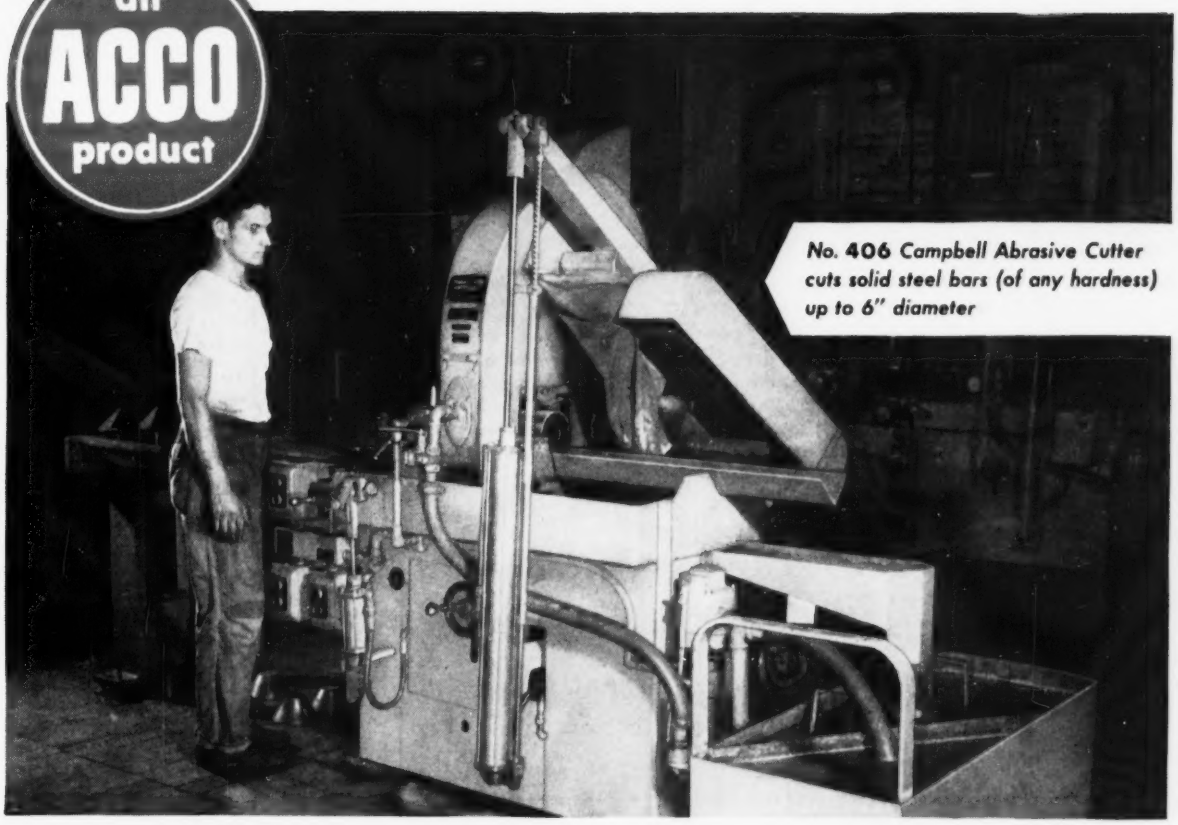
MILLING ATTACHMENTS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Fray Machine Tool Co., 515 W. Windsor Rd., Glendale 4, Calif.
Groton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sunstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING AND CENTERING MACHINES
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

(Continued on page 372)

For more information on products advertised, use Inquiry Card, page 247

an **ACCO** product



No. 406 Campbell Abrasive Cutter cuts solid steel bars (of any hardness) up to 6" diameter

CAMPBELL Abrasive Cutting Method Sets New Cut-Off Standards

• Recently CAMPBELL was called upon to cut samples of 8" x 8" No. 8740 Chrome Molybdenum steel each taking 210 minutes the old-fashioned way. The buyer was skeptical of the burn-free, smooth, close-tolerance cuts that took only 18 minutes each on the CAMPBELL NO. 480 which takes work up to 8" square. He insisted on seeing the CAMPBELL Cutter in operation cutting his own steel, which he did at a plant of one of our customers. He was convinced and placed his order for a CAMPBELL 480.

• • •

Perhaps you have cutting problems that can be solved with the speed, accuracy and quality of cuts you can get on a CAMPBELL Abrasive Cutter. If so, let us prove what this remarkable machine will do on your own material. Let us show you before your own eyes.

No matter what hardness or shape of metal you must cut repeatedly, if it will fit on one of many sizes of CAMPBELL Abrasive Cutters, which have a range up to 8" diameter solids and 20" diameter tubular, we'll show you how to cut it faster and better. Write today for "*Principles of Abrasive Cutting.*" Give us the material specifications and we'll be glad to make recommendations.

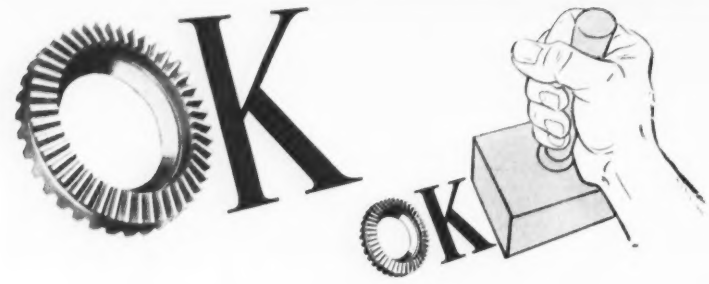
ACCO

TRADE MARK

CAMPBELL MACHINE DIVISION
AMERICAN CHAIN & CABLE

925 Connecticut Ave., Bridgeport 2, Conn.

CAMPBELL
Abrasive Cutters and Nibblers



Spur
Helical
Worm
Herringbone
Internal
*Coniflex Bevel
Spiral Bevel
Spline Shaft

Regardless of what Martin "Old Kinderhook" Van Buren had in mind when he introduced the term "OK" in the 1840 Presidential campaign, today "OK" has come to mean "well done." And "OK" is what our customers say about the custom gears we deliver to them. Why? Because the combination of attention to details and over 45 years of "know-how" means every gear we produce is a masterpiece of craftsmanship. So specify Cincinnati Gear on your next custom gear order—and you'll put your stamp of approval on our gears too.

*Reg. U. S. Pat. Off



THE CINCINNATI GEAR COMPANY

"Gears . . . Good Gears Only"

Wooster Pike and Mariemont Ave. • Cincinnati 27, Ohio

For SPECIAL BROACHES *QUICK, at LOW COST* — du MONT



Broaches like these, and many other pull-type, push-type and keyseating machine broaches fit our regular production tooling on the famous *Minute Man* Keyway Broaches

That's why we can make 'em for you quicker and cheaper. *So send us your specs. or prints.*

Note: We cannot make broaches longer than 36" or with cutting sections exceeding 20"; nor round, spline, rifling or irregular shaped broaches, nor square broaches less than ¼" across flats.

The du MONT CORPORATION, Greenfield, Mass.

MILLING MACHINES, Automatic

Adcock & Shipley Ltd., Ash St., Leicester, England
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Bench

Barker Engrg. Co., 500 Green Rd., Cleveland 21, Ohio
Hardinge Bros., Inc. (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Circular Continuous

Consolidated Machine Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Hand

Adcock & Shipley Ltd., Ash St., Leicester, England
Barker Engrg. Co., 500 Green Rd., Cleveland 21, Ohio
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Horizontal, Plain and Universal

Adcock & Shipley Ltd., Ash St., Leicester, England
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17.
Fray Machine Tool Co., 151 W. Windsor Rd., Glendale 4, Calif.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st. St., Milwaukee 14, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

(Continued on page 376)

For more information on products advertised, use Inquiry Card, page 247



"It can't be done.

You can't drill small holes and large holes at the same feed and speed."



"Well, let's see.

What do you pay off on? Feed? No! Speed? No! Production? YES!! —on your tooling cost and finished parts per hour."

DON'T YOU AGREE?

EXAMPLE (and it's extreme)

Drill stand has 30 holes 1/16" through 1/2" diameter. Completely drilled in two passes with two Zagar gearless drill heads, 16 spindles per head. All spindles run at 1200 r.p.m.

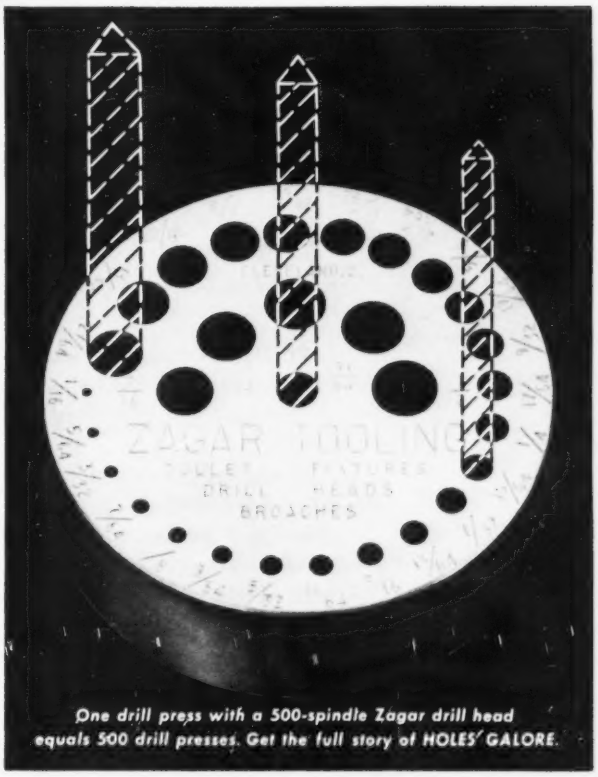
Conventional multi-speed method. So-called ideal speeds would be not less than three times as fast for the 1/16" drill as for the 1/2" drill. Ideal drill feed would be three times as heavy for the 1/2" as for the 1/16". Moreover, six passes would be necessary.

Zagar single-speed method. Only two passes. Feed is held down by strength of 1/16" drill, and speed is held down by 1/2" drill. Simplified operation; fewer indexes; far less handling. Production is at least tripled. Tooling costs drop enormously.

If you don't agree, what's your version?

★ ★ ★

WRITE FOR CATALOG "M-1".



One drill press with a 500-spindle Zagar drill head equals 500 drill presses. Get the full story of HOLES' GALORE.

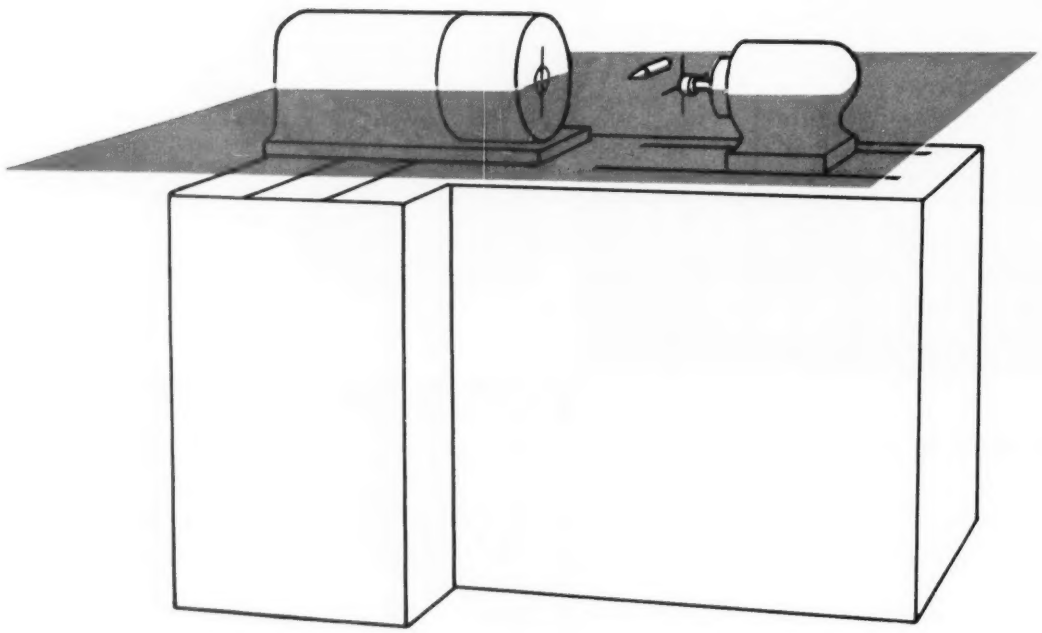
ZAGAR TOOL, INC.

24000 LAKELAND BLVD. • CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

alignment

for better internal grinding



THE elements of an internal grinder that affect its alignment are the ways (longitudinal and transverse), the workhead and wheelhead, and the diamond. These elements should be set up to meet the following requirements:

1. The longitudinal ways must produce a straight line of motion and the transverse ways must also produce a straight line of motion.

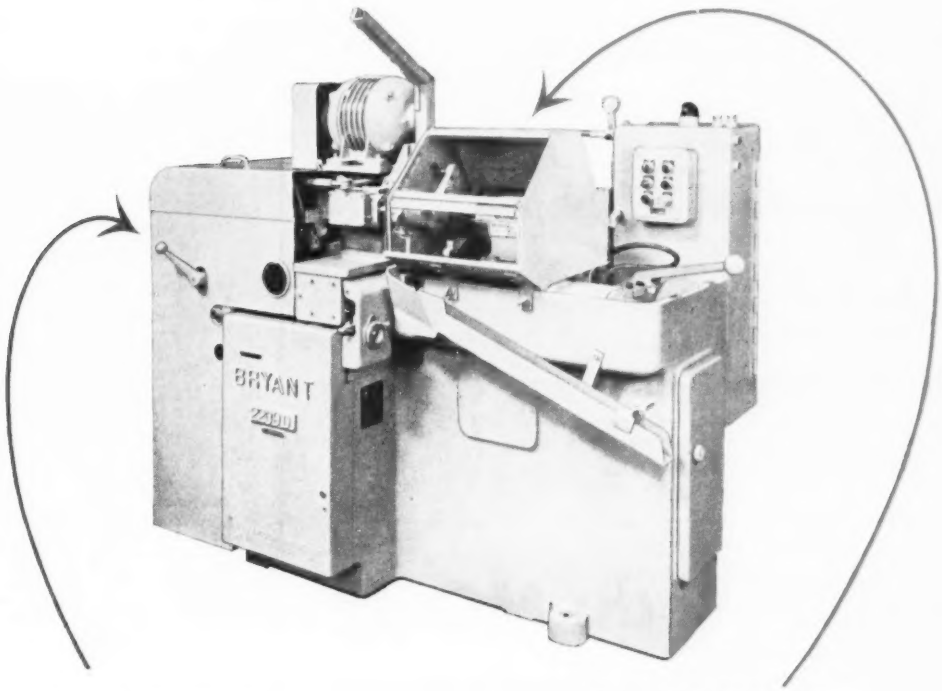
2. The workhead axis must lie in a plane parallel to the motion of the longitudinal ways.

3. The wheelhead axis must lie in the same plane as the workhead axis and be parallel to the motion of the longitudinal ways.

4. The diamond must lie in the plane established by the wheelhead axis and the workhead axis.

If these four requirements are met we will then have a straight line of contact between the grinding wheel and the work. This is the heart of the internal grinding process.

If the contact is not a straight line, the internal grinder is "out of line". Improper alignment may show up in the work as incorrect hole geometry (bell-mouth or taper) and poor surface finish. In addition, excessive wheel wear and poor wheel action may result.



Left end of workhead may be raised or lowered to bring its axis into a plane parallel with the wheel path.

Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

The No. 2209 machine is designed particularly for high production, precision grinding of bores from $\frac{1}{4}$" to 3" in ball bearing races, gears, rolls, bushings, etc. The entire cycle mechanism is a combination of cams and levers. The cycle is fully automatic as follows: load, rough grind, true wheel, finish grind, and unload. Automatic loading allows a single operator to handle a battery of machines — his duties consisting only of loading hoppers and changing grinding wheels. Wheel speeds up to 100,000 R.P.M. are obtained with the Bryant Hi-frequency wheelhead. Write for folder.

Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie — free showings arranged for engineering groups.

Bryant Chucking Grinder Co.

Springfield, Vermont, U. S. A.

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates



"I see you two girls got your jerseys mixed again."

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

BALANCED BITS

to *do most* per bit and per dollar for *You*



du MONT

Square and Rectangular

Super High Speed, Ground

TOOL BITS

Not increased red hardness at the expense of toughness. *Not* extra toughness at the expense of wear resistance or heat resistance. du Mont Bits are precisely blended and balanced to *do most* cutting, take a keener edge, stay on the job longer.

Try 'em just once.
You'll buy 'em from then on.

WEAR RESISTANCE
TOUGHNESS
RED HARDNESS

The du MONT CORPORATION, Greenfield, Mass.

MAIL ME FREE COMPARISON CHART and PRICE LIST M-1 on all standard sizes of square and rectangular bits.

Name.....

Company.....

Address.....

Pratt & Whitney, West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Planer Type

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R. Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Groton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Ram Type Universal

Fray Machine Tool Co., 515 W. Windsor Rd., Glendale 4, Calif.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Turret Type

Bridgeport Machines, Inc., Linley Ave., Bridgeport, Conn.

MILLING MACHINES, Vertical

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, Ill.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools.

MOLD AND DIE COPYING MACHINES

Cosc Corp., 405 Lexington Ave., New York 17.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.

(*Continued on page* 378)

For more information on products advertised, use Inquiry Card, page 247

Do you PUNCH, NOTCH, NIBBLE, SHEAR, FORM, BEAD, BLANK, DRAW, DRILL AND BORE *?*

WALES
FABRICATING EQUIPMENT
does it!



① WALES FABRICATOR for punching, notching and nibbling.

② WALES DRILLING MACHINE for locating, drilling, reaming and boring.

③ WALES TWIN COLUMN PRESS for punching, blanking, forming, drawing and bending.

④ WALES TRU-EDGE SHEAR for beading, folding, slotting, flanging, louver cutting, straight line and irregular circle cutting.

● There is a Wales Machine to do one or more of the above operations with *greater time-saving efficiencies.*

For example, the Wales Sheet Metal Fabricator is designed to punch, notch and nibble up to 165 strokes per minute. Wales "Quick Change" holder permits the changing of punches and dies for various round and shaped hole diameters up to 1¼" in a matter of seconds. *Time studies prove there is no other machine like it.*

Another example is the Wales Drilling Machine which locates, drills, reams and bores holes to jig borer accuracy.

Have the complete set of Wales Machinery Catalogs at your fingertips by writing *Today.*

WALES-STRIPPIT CORPORATION

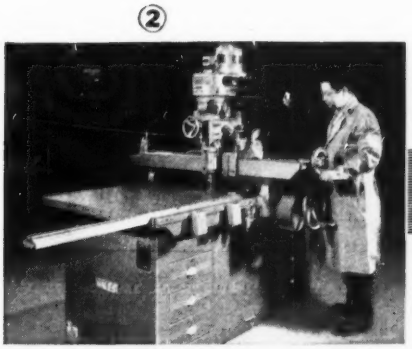
George F. Wales, *Chairman*

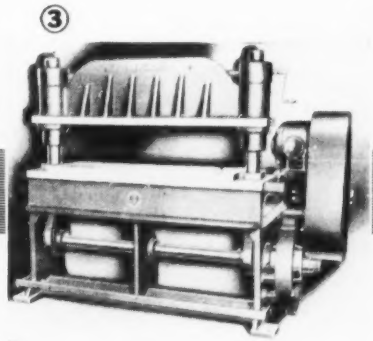
37 **Payne Avenue, North Tonawanda, N. Y.**

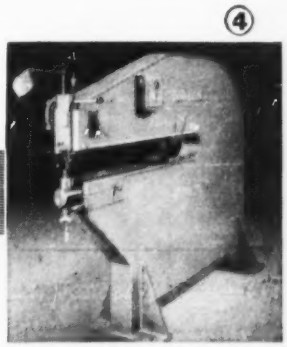
(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment

② 

③ 

④ 

Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

MOTORS, Hydraulic

Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MULTIPLE-SLIDE FORMING MACHINES

Nilson Machine Co., A. H., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

NIBBLING MACHINES

Campbell Machine Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport, Conn.

NIBBLING MACHINES, Nickel

International Nickel Co., Inc., 67 Wall St., New York, N. Y.
Wales-Strippit Corp., N. Tonawanda, N. Y.

NIPPLE THREADING MACHINERY

Landis Machine Co., Inc., Waynesboro, Pa.

NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, Ill.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Republic Steel Corp., (Union Drawn Steel Div.), Republic Bldg., Cleveland 1, Ohio.
Union Drawn Steel Co., Div., Republic Steel Corp., Massillon, Ohio.

NUTS, Self-locking

Grip Nut Co., 310 S. Michigan Ave., Chicago 4, Ill.

NUTS, Thumb or Wing and Cap

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only)
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Republic Steel Corp., Bolt and Nut Div., Republic Bldg., Cleveland 1, Ohio.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

OIL CUPS

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

OIL EXTRACTORS AND CLEANERS

De Laval Separator Co., Poughkeepsie, N. Y.

OIL GROOVERS

Wicaco Machine Co., Stenton Ave. and Louden St., Philadelphia, Pa.

OIL-HOLE COVERS

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

OIL SEALS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

OILERS AND LUBRICATORS

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.
Madison-Kipp Corp., Madison, Wis.

OILS, Cutting

See Cutting and Grinding Fluids.

OILS, Lubricating

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 600 5th Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

OILS, Quenching and Tempering

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 600 5th Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.

OILS, Soluble

See Compounds, Cutting, Grinding, Metal Drawing, Etc.

OPTICAL FLATS

Crane Packing Co., 1800 Cuyler Ave., Chicago.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

ORDNANCE MACHINES, Spelial

Rehnberg-Jacobson Mfg. Co., 2135 Kiswaukee St., Rockford, Ill.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.

Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PAINTING EQUIPMENT, Spray

Lowe Bros. Co., Dayton, Ohio.
Ransburg Electro-Coating Corp., 1234 Barth, Indianapolis 7, Ind.

PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

PILLOW BLOCKS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

PIPE, BRASS AND COPPER

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
American Brass Co., 25 Broadway, New York, N. Y.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

PIPE STEEL

Alleghany Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
United States Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

PIPE THREADING AND CUTTING MACHINES

Landis Machine Co., Inc., Waynesboro, Pa.

PIPE TONGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

PLANER ATTACHMENTS

Consolidated Mch. Tool Corp., Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves, Detroit, Mich.

PLANERS, Double Housing and Openside

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio (Plate).
Consolidated Mch. Tool Corp. (Incl. Plate, Rotary and Crank Types), Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

PLASTIC AND PLASTIC PRODUCTS

Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

PLATE ROLLS

Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

PLATES, Surface

Brown & Sharpe Mfg. Co., Providence, R. I.
Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.
Challenge Machinery Co., Grand Haven, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Pratt & Whitney Div., West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.

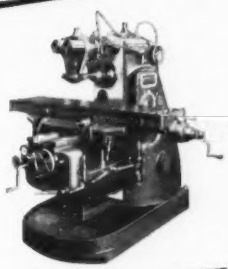
PNEUMATIC EQUIPMENT

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

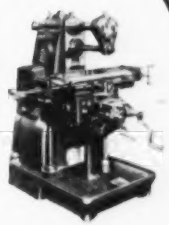
(*Continued on page* 380)

Don't just buy **a machine**

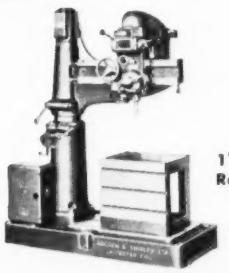
BUY 40 YEARS' EXPERIENCE in building machine tools



25 Horse Power Horizontal or Universal Miller

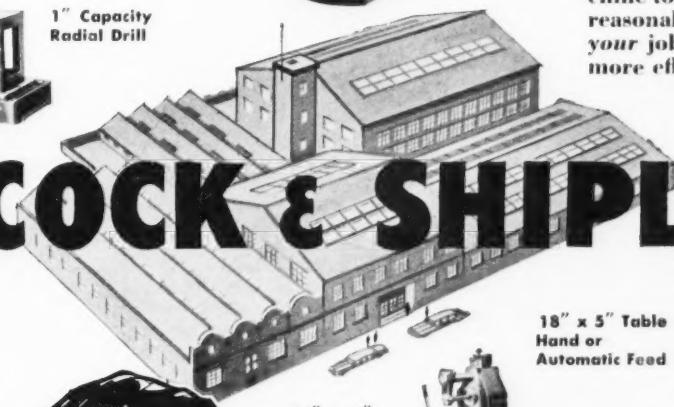


40" x 10" Table Universal



1" Capacity Radial Drill

Here is a range of machine tools offered at reasonable prices to do *your* jobs faster . . . more efficiently.



ADCOCK & SHIPLEY



18" x 5" Table Hand or Automatic Feed



26" x 7" Table Hand or Automatic Feed



Ring today!

- *Messrs. Reynolds Inc., 269 Eddy Street, Providence 3, Rhode Island.* **Tel: Jackson 1-3446**
- *The Gahr Machine Co. 19199 St. Claire Avenue, Cleveland 19, Ohio* **Tel: KEnmore 1-0053**
- *The Hill-Clarke Machinery 649 W. Washington Boulevard, Chicago.* **Tel: Central 6-0500**
- *Messrs. J. E. Livingstone, 16516 James Couzens Highway, Detroit 21, Michigan.* **Tel: University 4-7880-1**
- *Air Transport Equipment Inc. Old Country Road, Mineola, New York.* **Tel: Garden City 7-6666**

Or write to:

ADCOCK & SHIPLEY LTD., ASH STREET, LEICESTER, ENGLAND

PHONE: LEICESTER 65154-6 **GRAMS AND CABLES: 'Adcock' LEICESTER**

For more information on products advertised, use Inquiry Card, page 247



In a four month period under actual competitive conditions one Diamond Wheel ground 36,976 pieces, while eight silicon carbide wheels ground a total 16,023 pieces.

RESULT— 1. Less cost per piece 2. Greater Production 3. Less down time.

See for yourself how

SECOMET DIAMOND WHEELS

can provide you with these plus values

Send for informative catalog #54 or contact us direct for information and assistance.

J. K. SMIT & SONS, INC.

MURRAY HILL, N. J.

Thor Power Tool Co., Aurora, Ill.

POLISHING LATHES AND MACHINES

Black & Decker Mfg. Co., Penna. Ave., Towson, Md.
Gardner Machine Co., (Div. Landis Tool Co.), 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Millers Falls Co., Greenfield, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POLISHING TOOLS, Portable

Jarvis, Charles L., Co., Middletown, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POWER UNITS, Hydraulic

See Hydraulic Power Units or Tool Heads

PRESSES, Air

Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.

PRESSES, Arbor

Bellows Co., 230 W. Market St., Akron, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
duMont Corp., Greenfield, Mass.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilburn Ave., Chicago.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Tomkins-Johnson Co., 614 No. Mechanic St., Jackson, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PRESSES, Broaching

American Broach & Mch. Co., Ann Arbor, Mich.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Die Tryout

Alpha Tool Works, 9281 Freeland Ave., Detroit 28, Mich.

PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

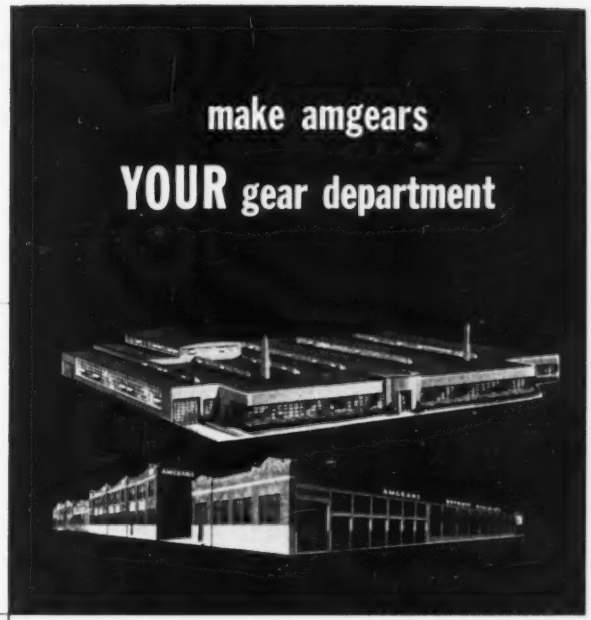
PRESSES, Foot

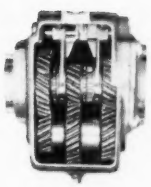
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
B & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

(Continued on page 382)

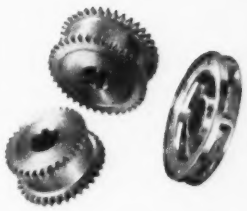
For more information on products advertised, use Inquiry Card, page 247

gears and gear assemblies





transmission gears and assemblies



special gears and gear assemblies



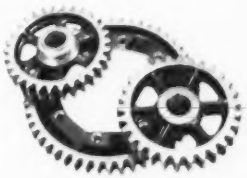
spiral bevel gears



gears and gear assemblies for farm implements and tractors



bevel gears for all industry



gears for power shovels

gears and gear assemblies for tanks



CLEVELAND • DETROIT • CHICAGO

ACCURATELY MADE **AM gears,** INC.
A SUBSIDIARY OF MUPP CORPORATION

2 BIG PLANTS *for gears and gear assemblies with a customer list that reads like Who's Who in American Industry.*

CHICAGO 6633 West 65th Street, Chicago 38 **DETROIT** 7450 Melville, Detroit 17

PRESSES, Forging

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Morgan Engrg. Co., Alliance, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Hydraulic

American Broach & Mch. Co., Ann Arbor, Mich.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Clearing Machine Corp., 6499 W. 65th St. Chicago 38, Ill.
Clifton Hydraulic Press Co., Clifton, N. J.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago III.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

PRESSES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

PRESSES, Screw

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Walsh Press & Die Co., 4727 W. Kinzie St. Chicago 44, Ill.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Sheet Metal Working

Allen, Alva F., Box 426, Clinton, Mo.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Johnson Mch. & Press Corp., 620 W. Indiana Ave., Elkhart, Ind.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Sales Service Mch. Tool Co., 2363 University Ave., St Paul, Minn
Verson Allsteel Press Co, 93rd St. and S. Kenwood Ave., Chicago, Ill.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Wales-Strippit Corp., N. Tonawanda, N. Y.
Walsh Press & Die Co., 4727 W. Kinzie St., Chicago 44, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, (Hydraulic) 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PROFILE—TRACING ATTACHMENTS

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa., (Lathe).

PROFILING MACHINES

Consolidated Mch. Tool Corp., Rochester, N.Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Morey Mchry. Co., Inc. (and affiliated companies), 410 Broome St., New York, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pines Engineering Co., Inc., Aurora, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

(*Continued on page* 384)

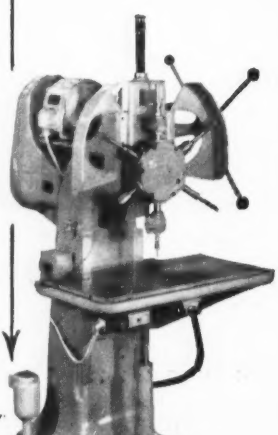
A RUTHMAN GUSHER COOLANT PUMP

RIGHT FOR THE JOB . . .

There is a Ruthman Gusher Coolant Pump to meet practically every coolant system requirement, with motor capacities from 1/10 to 2 H. P.

Each model has the same outstanding characteristics; simple construction with fewer parts to wear, dynamically balanced rotating shaft, pre-lubricated heavy-duty ball bearings, automatic priming with no packing foot or relief valves needed.

When you specify Ruthman Gusher Coolant Pumps you're sure they're right for the job. Write today for information on various models available.



Illustrated is a Burgmaster Drill equipped with a Gusher Coolant Pump. Photo, courtesy Burg Tool Co.

THE RUTHMAN MACHINERY CO.

1807 READING ROAD CINCINNATI 2, OHIO

For more information on products advertised, use Inquiry Card, page 247

SPACEMAKER AIR CYLINDERS
catalog SM 454



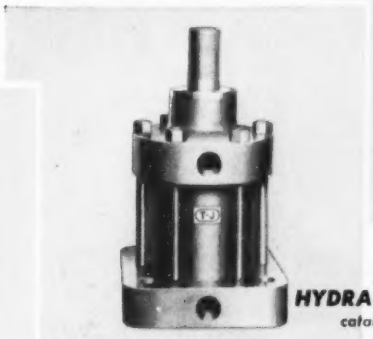
T-J

BUILT TO *TAKE IT!*

BACKED BY 38 YEARS OF KNOW-HOW!

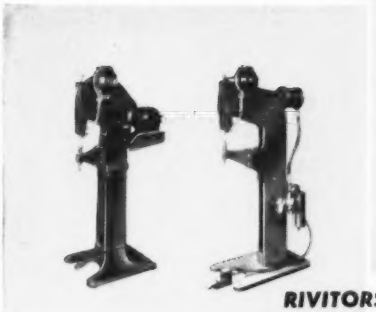


CLINCHORS
catalog 847



AIR AND HYDRAULIC CYLINDERS
catalogs 43 and H-47

Off shelf delivery all styles to 3" bore in increments of 1" to 12" stroke.



RIVITORS
catalog 847



DIE SINKING MILLING CUTTERS
catalog 4-153

Let T-J performance help you *save labor* and *reduce costs* in your plant today! You'll find T-J products soundly engineered and ruggedly built for tough jobs in a wide range of applications.

For efficient power movement in pushing, pulling or lifting—up to 50,000 lb.—T-J Air and Hydraulic Cylinders with new Super Cushion and space-saving features! For high production in rivet-setting, T-J Rivitors with automatic feeding and setting . . . air or electric power. For setting clinch nuts in automotive body panels, door locks and other products . . . T-J Clinchors! For more work between grinds in tough die steel . . . T-J Cutters! For accurate, automatic control of presses, brakes, other machines and equipment . . . T-J Air Controls! To cut replacement costs in half . . . T-J Reamers with interchangeable heads!

Get T-J all the way for tough jobs! Send for latest catalogs. The Tomkins-Johnson Co., Jackson, Mich.



REAMERS
bulletin 752 and 153

TOMKINS-JOHNSON T-J

RIVITORS . . AIR AND HYDRAULIC CYLINDERS . . CUTTERS . . CLINCHORS

. . . for tough jobs



REMOTE CONTROLS
catalog 645

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 620 E. Vienna Ave., Milwaukee, Wis.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tompkins-Johnson Co., Jackson, Mich.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Thor Power Tool Co., Aurora, Ill.

PUMPS, Rotary

Brown & Sharpe Mfg. Co., Providence, R. I.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Thor Power Tool Co., Aurora, Ill.
Tuthill Pump Co., 939 E. 95th St., Chicago, 19, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

PUNCHES, Centering

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

PUNCHING MACHINERY

Allen, Alva F., Box 426, Clinton, Mo.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N.Y.
Famco Machine Tool Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Wales-Strippit Corp., N. Tonawanda, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

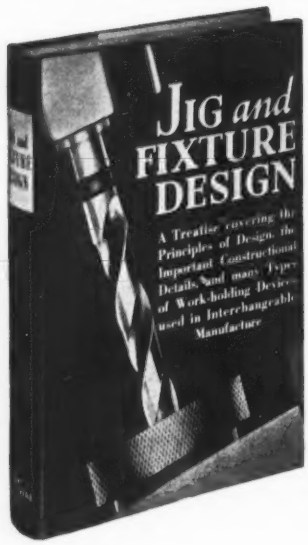
RACKS, Gear Cut

Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

REAMER HOLDERS

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

The Right Answers to Your Jig Design Problems



382 Pages
327 Illustrations

$4.00

Postpaid in U. S.
Canadian or foreign
Price, $4.00

• **JIG AND FIXTURE DESIGN is a thorough and comprehensive treatise covering the principles of design and the important constructional details of all classes of jigs and fixtures. Numerous illustrations (almost one to a page!) show actual examples of many different types of jigs and fixtures used in interchangeable manufacture.**

THE INDUSTRIAL PRESS, 148 Lafayette Street, New York 13, N. Y.

Please send me Jig and Fixture Design, price $4.00. If I keep the book I will pay within five days.

Name Position

Company

Street and No.

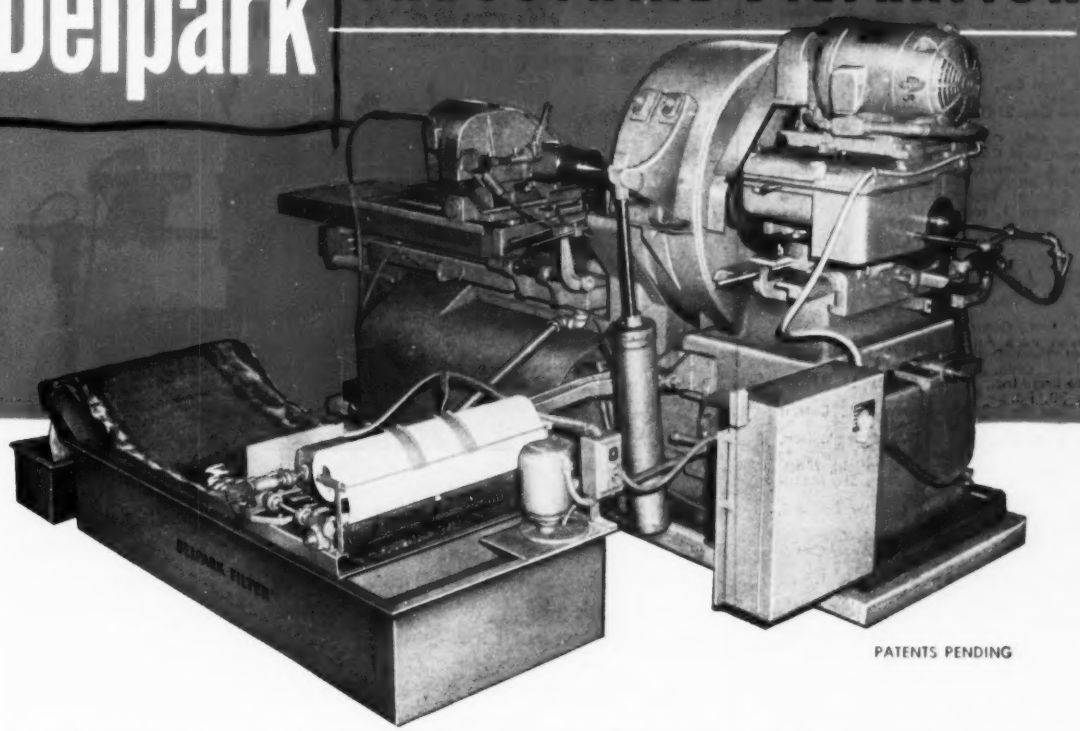
City Zone State

M1/54

For more information on products advertised, use Inquiry Card, page 247

"Carefree and Inexpensive Operation"

SAYS WILLYS MOTORS, INC.
TOLEDO, OHIO
OF
Delpark INDUSTRIAL FILTRATION



PATENTS PENDING

The DELPARK Story runs true to form at *Willys Motors, Inc.* Here, where a number of DELPARK Filters are in service 16 hours a day, they operate with little attention at a minimum of cost.

Willys Motors says, "We never have to change the coolant, or clean the tank, excepting perhaps on a six month basis, to remove contaminants from floor sweepings. Time spent in cleaning tanks with conventional equipment would many times pay for the filter equipment."

There is one other point to remember: that DELPARK Filters make possible the full capabilities of fine precision grinders which otherwise would be impossible. Greater machine efficiency and fewer rejects add even more to the enormous savings made possible with DELPARK Filters.

DELPARK engineers are ready to help you with your specific problems. *Write today for more complete information.*

Delpark INDUSTRIAL FILTRATION

Backed by more than 30 years experience in Industrial Filtration
INDUSTRIAL FILTRATION COMPANY . LEBANON, INDIANA

INDUSTRIAL FILTRATION COMPANY
15 Industrial Avenue, Lebanon, Indiana

Gentlemen: We would like more information on DELPARK Industrial Filters applied to coolants.

Name_____ Title_____

Company_____

Address_____

City_____ State_____

REAMERS
Atrax Co., Newington, Conn.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 27, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

REAMERS, Adjustable
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMERS, Taper Pin
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMING MACHINES
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Greaves Machine Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

(*Continued on page* 388)

RECORDING INSTRUMENTS for Counting
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

REELS, Stock, Standard and Automatic
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

REFRACTORS, Heat-Treating Furnace
Norton Co., 1 New Bond St., Worcester 6, Mass.

REGULATORS, Temperature
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
General Electric Co., Schenectady, N. Y.

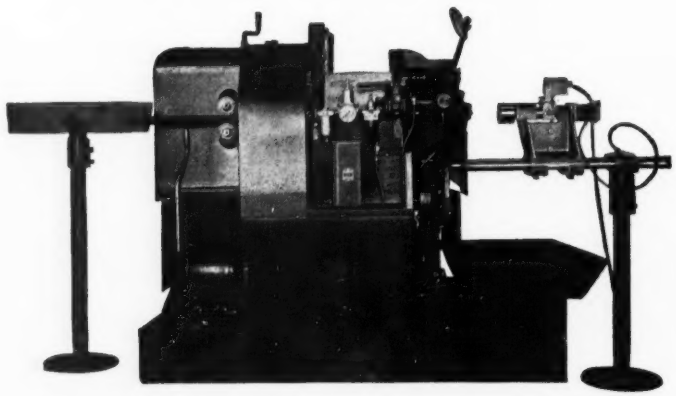
REMOVERS, Japan, Enamel, Etc.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

RETAINING RINGS FOR BEARINGS, Etc.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Waldes-Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

RHEOSTATS
Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

(*Continued on page* 408)

The NEW MODERN AUTOMATIC
CUTTING-OFF MACHINE



Cuts Off Tubing, Pipe and Shafting . . . FAST

Cuts off longer pieces than a regular automatic machine. In fact, cuts off *any length you want*—and cuts it *faster*. If your production *requires* quantity cutting-off of tubing, pipe or shafting, check the figures below against your present time.

1/2" Tubing
This machine cuts off and chamfers both outside edges of ½" .030 wall tubing, 5" long, at the rate of one every 2.5 seconds.

1 1/4" Cold Rolled
This machine cuts off and chamfers both ends of 1¼" cold rolled, 20" long, at the rate of one every 20 seconds.

1" Tubing
This machine cuts off and chamfers both outside edges of 3" long, at the rate of one every 3 seconds.

These popular, time saving machines are now available in four sizes, handling work up to 6¾" O.D. Their many cost cutting features are described and illustrated in our latest catalog that will be mailed promptly on request.

4" Threaded Studs



Cut and chamfered at one time—in 8 seconds—from 10 ft. length of stock already threaded. (¾" U. S. Standard.) Clean cut. Clean chamfer. Nuts start easily, with no extra finishing required.

WRITE FOR ILLUSTRATED CATALOG.

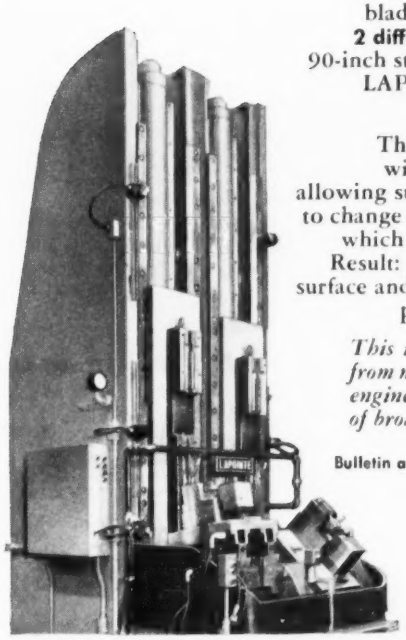
MODERN MACHINE TOOL CO.
Jackson, Michigan

For more information on products advertised, use Inquiry Card, page 247

no one else can do it!

the LAPOINTE Mid-cycle Retilting AUTOMATIC FIXTURE permits the BROACHING of NON-PARALLEL CONTOURS in a single pass

without removing the part from the fixture!

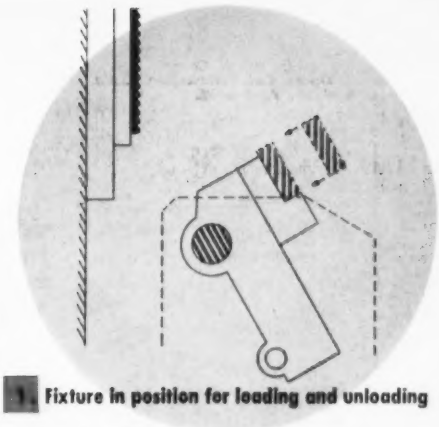


Necks of stainless steel turbine blades are finished-broached at **2 different angles** on this 15-ton 90-inch stroke Double Ram Vertical LAPOINTE Surface Broaching Machine.

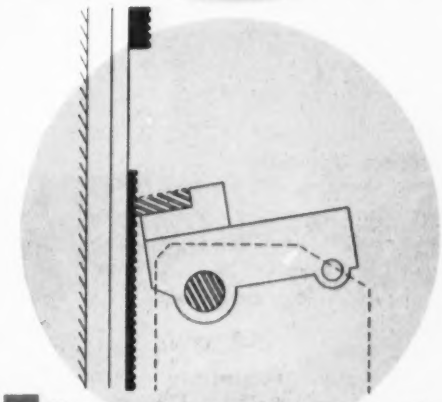
The broach is in two sections with a "dwell" between, thus allowing sufficient time for the fixture to change position for the second cut which occurs **on the same stroke.** Result: removal of .340" stock per surface and a production of 240 parts per hour, at 80% efficiency.

This is another example resulting from more than 50 years of Lapointe engineering . . . entirely in the field of broaching.

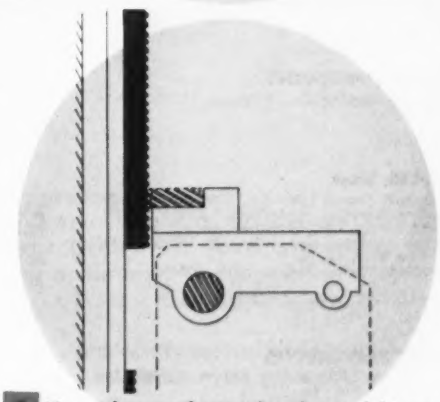
Bulletin available on request. Ask for DRV-1



1. Fixture in position for loading and unloading



2. Fixture in first operation of taper cut



3. Fixture in second operation, for straight cut

15-TON 90" DRV LAPOINTE BROACHING MACHINE

This mid-cycle retilting automatic fixture is synchronized with full electrical interlocks.

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

RIVET SETS
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Peck, Stow & Wilcox Co., Southington, Conn.
Thor Power Tool Co., Aurora, Ill.

RIVETERS, Hydraulic
Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

RIVETERS, Pneumatic
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Thor Power Tool Co., Aurora, Ill.

RIVETING MACHINES
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Tomkins-Johnson Co., Jackson, Mich.

RIVET MAKING MACHINES
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

RUBBER PRODUCTS
Garlock Packing Co., Palmyra, N. Y.

RULES, Steel
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S. Co., Athol, Mass.

RUST PREVENTIVES
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAND BLAST EQUIPMENT
See Blast Cleaning Equipment

SANDERS
Black & Decker Mfg. Co., E. Penna Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ingersoll-Rand Co., Phillipsburgh, N. J.
Jarvis, Charles L., Co., Middletown, Conn.
Keller Tool Co., Grand Haven, Mich.
Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Thor Power Tool Co., Aurora, Ill.

SAW BLADES, Hack
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S. Co., Athol, Mass.
Victor Saw Works, Inc., Middletown, N. Y.

SAW SHARPENING MACHINES
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAWING MACHINES, Circular
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.

SAWING MACHINES, Friction
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.

SAWING MACHINES, Metal Cutting Band
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob Bros., Grafton, Wis.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

SAWING MACHINES, Power Hack
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Thor Power Tool Co., Aurora, Ill.
Victor Saw Works, Inc., Middletown, N. Y.

SAWS, Circular Metal Cutting
Alina Corp., 401 Broadway, New York 13, N. Y. (Portable).
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Consolidated Mch. Tool Corp., Rochester, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Johnson Mfg. Co., Albion, Mich.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Twist Drill & Tool Co., & Winter Bros., & Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Union Twist Drill Co., Athol, Mass.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

SAWS, Metal Cutting Band
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
Delta Power Tool Div., Rockwell Mfg. Co. 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Johnson Mfg. Co., Albion, Mich.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

SAWS, Portable Electric
Black & Decker Mfg. Co., E. Penna, Ave., Towson, Md.
Millers Falls Co., Greenfield, Ohio

SAWS, Screw Slotting
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

SCRAPERS, Hand and Power
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

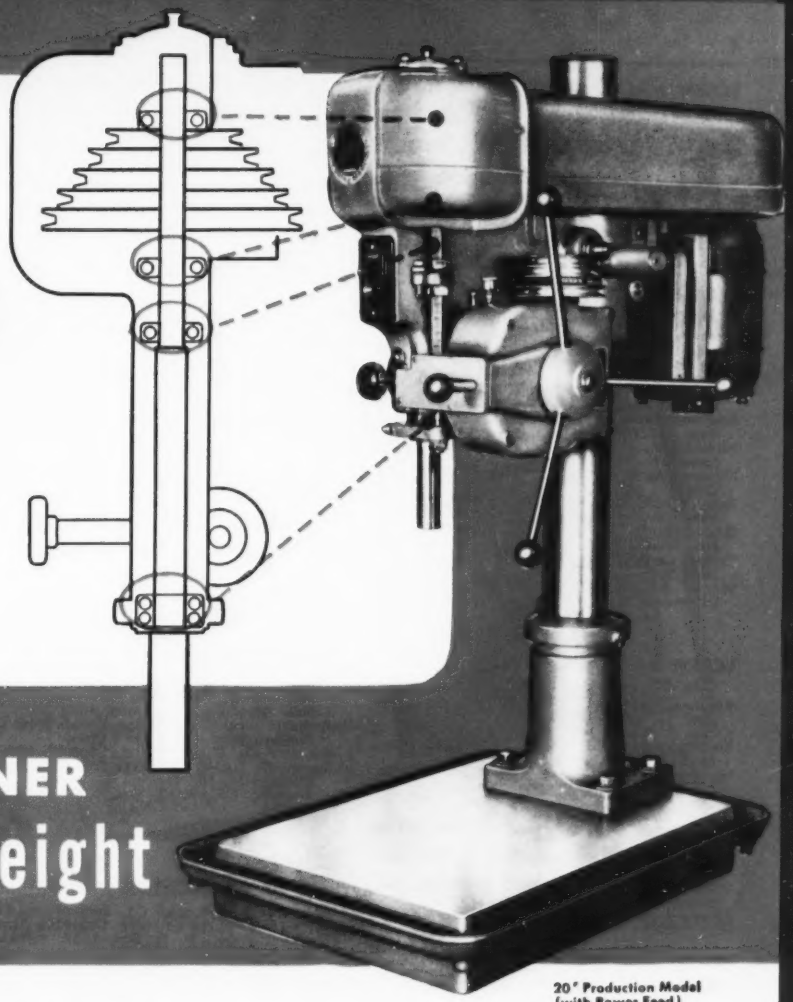
SCREW DRIVERS, Power
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.

SCREW DRIVING AND NUT SETTING EQUIPMENT
Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Jarvis, Charles L., Co., Middletown, Conn.
Keller Tool Co., Grand Haven, Mich.
Thor Power Tool Co., Aurora, Ill.

SCREW MACHINE TOOLS AND EQUIPMENT
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

(*Continued on page* 390)

Better HEAD-work makes this



20" Production Model (with Power Feed)

WALKER-TURNER Light-Heavyweight

A CHAMP IN PRODUCTION

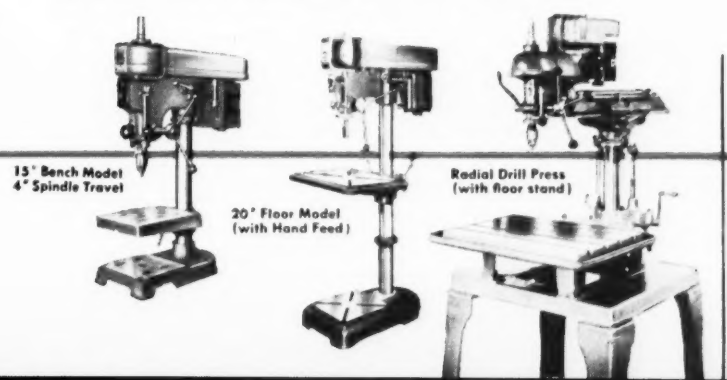
In every way this Walker-Turner 20" Drill Press is built to turn in an outstanding performance for you. The HEAD construction is a first-class example.

You find: a heavy cast iron head line-bored in one operation for the ultimate in accuracy, a ten spline spindle ground on centers for perfect balance, 4 grease-sealed ball bearings, pulley suspended on 2 ball bearings freeing the spindle from distortion or whip due to belt tension . . . and other features typical of top-flight engineering.

When you take a good look at the Walker-Turner *Light-Heavyweight* Drill Press you'll agree that it represents a real opportunity to cut your investment in equipment. You'll see it has what it takes to handle most any job.

Your Walker-Turner factory-trained distributor will show you all the fine features—just phone him. Or mail coupon.

SOLD THROUGH *FACTORY-TRAINED* INDUSTRIAL DISTRIBUTORS



15" Bench Model 4" Spindle Travel

20" Floor Model (with Hand Feed)

Radial Drill Press (with floor stand)

WALKER-TURNER

• DIVISION •

KEARNEY AND TRECKER CORPORATION

PLAINFIELD, N. J.

Drill Presses — Hand and Power Feed • Radial Drills
Wood and Metal Cutting Band Saws • Tilting Arbor Saws
Radial Saws • Jig Saws • Lathes • Spindle Shapers
Jointers • Belt and Disc Surfacers • Flexible Shaft Machines

Use this space

to send for full details and specifications.
Walker-Turner Division, Kearney & Trecker Corp.
Dept. M-1, Plainfield, N. J.

SCREW MACHINE WORK

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Eastern Mch. Screw Corp., New Haven, Conn.
Morse Twist Drill & Tool Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland.
Ottemiller, W. H., Co., York, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
Wicaco Machine Corp., Stenton Ave., and Louden St., Philadelphia, Pa.

SCREW MACHINES, Automatic Single and Multiple Spindle

Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cosa Corp, 405 Lexington Ave., New York 17, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINES, Hand
See aso Lathes, Turret

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW PLATES

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Winter Bros. Co., Rochester, Mich.

SCREWS, Cap, Set, Safety Set and Machine, Etc.

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Chicago Screw Co., Bellwood, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Self-tapping, Drive

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

SCREWS, Thumb

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

SEALS AND RETAINERS, Oil or Grease

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

SECOND-HAND MACHINERY, Etc.

Eastern Machinery Co., 1006 Tennessee Ave., Cincinnati 22, Ohio.
Miles Machinery Co., Box 770 Saginaw, Mich.
Morey Machry, Co., Inc., 410 Broome St., New York, N. Y.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

SEPARATORS, Centrifugal

De Laval Separator Co., Poughkeepsie, N. Y.
The Sharples Corp., 2300 Westmoreland St., Philadelphia 40, Pa.

SEPARATORS, Oil or Coolant

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
The Sharples Corp., 2300 Westmoreland St., Philadelphia 40, Pa.

SHAFTING, Steel

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
De Laval Separator Co., Poughkeepsie, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg. Cleveland 1 Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Summerill Tubing Co., Div. Columbia Steel & Chicago 18, Ill.
Shafting Co., P. O. Box 1557 Pittsburgh, 30, Pa.

SHAFTS

National Forge & Ordnance Co., Irvine, Warren County, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

SHAFTS, Flexible

Jarvis, Chas. L., Co., Middletown, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.

SHAFTS, Hollow-Bored

Bethlehem Steel Co., Bethlehem, Pa.

SHAFTS, Turned and Ground

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

SHAPER-PLANERS

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPERS

American Tool Works Co., Pearl and Eggleston Ave., Cincinnati, Ohio.
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hendey Machine Co., Inc., Torrington, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Morton Mfg. Co., Muskegon Heights, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Smith & Mills Shapers, Inc., Div. Hamilton-Thomas Corp., Hamilton, O.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

SHAPERS, Vertical

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPES, Cold Drawn Steel

Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

SHAPES, Structural

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div. Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEARING MACHINERY

Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N.Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilburn Ave., Chicago, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

SHEARS, Alligator

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

SHEARS, Rotary

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co. (Knives), 470 Main St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

SHEARS, Squaring

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheriden Rd., Kenosha, Wis.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Simonds Saw & Steel Co. (Blades), 470 Main St., Fitchburg, Mass.

SHEET METALS

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
American Brass Co., 25 Broadway, New York, N. Y.

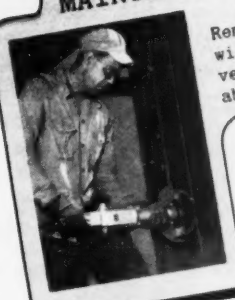
(Continued on page 392)

Black & Decker
Cases for Comment

MAINTENANCE

(Case History 8168)

Removing rust fast with wire brush and versatile B&D Portable Grinder



CONSTRUCTION

(Case History 10634)

1616 houses built at 2-a-day rate... thanks to B&D Heavy-Duty Saws



PRODUCTION

(Case History 10691)

20% more production
20% faster...it's a
Black & Decker Drill

Photo shows drilling of 10 gauge steel for Victor Furnace. Manufacturer reports use of B&D Drill resulted in 20% speed up, 20% production increase. Drills standing up very well after 8–10 years use...8 hrs. a day...5½ days a week.

Jack-Sure shows long, trouble-free service





SMALL DRILLS. Typified by "handful of power" ¼" Heavy-Duty Holgun.* Ideal production tool. Exceptional in "close-corner" drilling.



LARGER DRILLS . . . Models and speeds to fit any job in capacities from ¼" to 1¼" in steel, double in hardwood.



SCREW DRIVERS . . . Drive anything from delicate screws to large nuts and bolts. Many models, positive and adjustable clutches.



SANDERS . . . Drive abrasive discs, wire cup brushes, saucer grinding wheels, other attachments. Four models, 7" and 9" capacities.



BENCH GRINDERS . . . Three models, 6"—10" wheel diams., ¼ to 1 H.P., for sharpening, grinding, wire brushing, buffing.



POLISHERS . . . Clean, polish, seal in *one* operation. Three models including unit with *exclusive* automatic polish feed.



HAMMERS . . . Drive star drills, bull points, etc., in masonry, other materials. Four models, ½" to 2" hole-capacity in concrete.



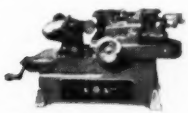
PORTO-SHEARS* . . . For fast, accurate cutting of ferrous and nonferrous sheet metal. Two models, 12 & 16 gauge capacities in steel.



VALVE SEAT GRINDERS . . . Famous "Vibro-Centric"* action puts a mirror finish on internal combustion engine valve seats in seconds.



PORTABLE GRINDERS . . . Bring the tool to heavy, bulky, hard-to-move work. Perfectly balanced. 3", 5" and 6" wheel diams.



VALVE REFACERS . . . Speedily grind factory-accurate angle on valve faces. Also grind valve stems, tappets and rocker arms for exact clearance.



FACTORY SERVICE . . . A B&D *extra!* Nationwide company-operated branches within 24 hours of *any* customer provide fast, accurate service at reasonable cost!

Industry reports prove . . . for increasing production . . . speedier construction . . . easier maintenance . . . *at lower cost* . . . it's hard to beat Black & Decker Power. They find that in every B&D Portable Electric Tool they get just the right power to do the job.

And they can be sure of getting this right power in B&D Drills, Screw Drivers, Saws, Grinders, etc., because Black & Decker custom builds its own motors. These motors, plus husky housings and precision parts, mean you get a tool that's easy to work with and hard to hurt. In every B&D Tool you have a real time-, trouble-, money-, and manpower-saver.

Want more information? Then ask around your industry . . . your own shop. Call your B&D Distributor for demonstration. And write for your copy of the complete *1954* B&D catalog. Address: THE BLACK & DECKER MFG. CO., 605 Pennsylvania Ave., Towson 4, Maryland.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker
PORTABLE ELECTRIC TOOLS

* Trade Mark Reg. U. S. Pat. Off.

Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave. Pittsburgh, Pa.

SHEETS, Iron and Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Street Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHIMS

Laminated Shim Co., Inc., Glenbrook, Conn.

SLEEVES

Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

SLOTTING MACHINES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N.Y.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Wks., 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist & Drill Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

SPECIAL MACHINERY AND TOOLS

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baker Bros., Inc., Sta. F., P. O. Box 101, Toledo 10, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bethlehem Steel Co., Bethlehem, Pa.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Consolidated Mch. Tool Corp., Rochester, N.Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp. 1200 Oakman Blvd., Detroit 32, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
John, B. Manufacturing Co., Ellis St., New Britain, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Michigan Tool Co., 7171 E. McNicholas Rd., Detroit 12, Mich.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morgan Engrg. Co., Alliance Ohio.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Motch Match & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S 7th and N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester Mich.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Waltham Machine Works, Newton St., Waltham Mass.
Wicoco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.
Zagar Tool Co., 24000 Lakeland Blvd., Cleveland 23, Ohio.

SPEED REDUCERS

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears, Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
General Electric Co., Schenectary, N. Y.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Pope Mchry. Corp., Haverhill, Mass.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

SPINNING LATHES

See Chucking Machines.

SPROCKET CHAINS

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

SPROCKETS

Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

STAMPINGS, All Metal

LaSalle Steel Co., Hammond, Ind.
Mullins Manufacturing Corp., Salem, Ohio.
Winzeler Mfg. & Tool Co., 1712 West Arcade Pl., Chicago 12, Ill.

STAMPINGS, Sheet Metal

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Laminated Shim Co., Inc., Glenbrook, Conn.
Mullins Manufacturing Corp., Salem, Ohio.
Republic Steel Corp., Niles Steel Products Div., Republic Bldg., Cleveland 1, Ohio.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.
Winzeler Mfg. & Tool Co., 1712 West Arcade Pl., Chicago 12, Ill.

STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.

(*Continued on page 394*)

WHAT DOES FIRTH STERLING OFFER YOU?

(ANSWER NUMBER 4)

RESEARCH THAT ANTICIPATES TOMORROW'S NEEDS

Our objective is to help *you* solve the technical and metallurgical problems of an *atomic* age *before* they arise . . . not *after*. So, at Firth Sterling, constant emphasis is on full-scale research, development, and production in specialty steels, carbides, new metals, and new methods.

Out of this determination to be ahead, not just abreast of need, has come this amazing three year record of achievement in *your* interest:

- A method of heat tinting that makes *Color Metallography* practical for determining the exact structure-property relationship of carbide mixtures.*
- New metals of great present and future potential that include heavy metal, three grades of chromium carbide, titanium carbide, and high temperature alloys.
- Cermets—those amazing hybrids of ceramic and metal, possessing in *combination* the best characteristics of each, to overcome modern technological problems.
- Zirconium—in ingot, billet, bar, rod, strip, sheet, wire, and tubing form—soon to be available for industrial applications.
- A new chemical plant, employing the most advanced processes and equipment, producing ammonium paratungstate of the highest *purity* to improve the quality of our tungsten carbides.
- Method "X"—an electro-mechanical process for machining metals that are unmachinable by conventional means.

Yes, all these are the result of "accent on research" . . . the justification for our statement

Firth Sterling Stands for Metallurgical Achievement—Past, Present, Future

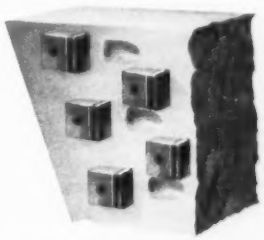
*Write for reprint of article from Oct. 19, 1953 issue of STEEL.

Cut Inventories with

Standard Firthite Tipped Broach Tools

Now, automobile and other manufacturers can keep broach tool inventories at a minimum and be assured of *off-the-shelf delivery* on *standard* Firthite tipped broach tools and almost equally fast service on "standards" modified to suit individual tooling requirements. Firth Sterling broach tools come in three standard sizes and styles.

The addition of broach tools to the constantly expanding line of *standard* Firthite Carbide Tools is the result of close engineering cooperation with one of the major



broaching machine manufacturers, whose huge new broaching machines are playing such an important part in the mass production of cylinder blocks for today's automobile engines.

The outstanding performance record of these Firthite broach tools has resulted in a continuing demand that enables us to make them stock items. Always specify Firthite broach tools for increased production and economical machining.

Prompt delivery may also be had on solid Firthite finishing blades.

Drop us a line for detailed engineering information or literature. P-11

Firth Sterling

—INC—

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

OFFICES* AND WAREHOUSES: BIRMINGHAM* CHICAGO CLEVELAND DAYTON* DETROIT HARTFORD HOUSTON* LOS ANGELES NEW YORK* PHILADELPHIA* PITTSBURGH* WASHINGTON* WESTFIELD, N.J.*

PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets

U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div. Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
U. S. Steel Supply Div., U. S. Steel Co., 208 S. LaSalle St., Chicago 4, Ill.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Cold Drawn

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Stele Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Jones & Laughlin Steel Corp., Gateway Scenter No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Massillon, Ohio.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Summerill Tubing Co. Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div.) 436 7th Ave., Pittsburgh, Pa.,
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, High Speed Tool

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Machine

Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg, Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St. Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Redeemer, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div. Carnegie-Illinois Steel Corp. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Strip and Sheet

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

STEEL, Tool and Die

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenters Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

STEEL ALLOYS

See Alloys, Steel

STEEL BARS

See Bars, Steel

STEEL STOCK GROUND FLAT

Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett, The L. S., Co., Athol, Mass.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

STELLITE

Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

STOCKS, Die

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. of Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

STONES, Oil or Sharpening

Bay State Abrasive Co., Westboro, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.

STOOLS

Standard Pressed Steel Co., Jenkintown, Pa.

STRAIGHTEDGES

Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

STRAIGHTENERS, Flat Stock and Wire

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

STRAIGHTENING MACHINERY

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

STRIPPING UNITS, Die

Wales-Strippit Corp., N. Tonawanda, N. Y.

STUD SETTERS

Errington Mechanical Laboratory Inc. 24 Norwood Ave., Stapleton, S. I., N. Y.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

SUB-PRESSES

Waltham Machine Works, Newton St., Waltham, Mass.

SUPERFINISHING MACHINES

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

SURFACE PLATES

See Plates, Surface

SWAGING MACHINES

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Torrington Co., Torrington, Conn.

SWITCHES

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
Centrol Products, Inc., (Waterproof and Thermol), 306 Sussex St., Harrison, N. J.
General Electric Co., Schenectady, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

TACHOMETERS

Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

TAPER PINS, Standard

Alimetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only).
Chicago Screw Co., Bellwood, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.

TAP HOLDERS

Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles 34, Calif.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
McCrosky Tool Co., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

TAPPING ATTACHMENTS AND DEVICES

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

TAPPING MACHINES

Associated Mch. Tool Corp., P. O. Box 9666, 535 McNeilly Rd., Pittsburgh 26, Pa.
Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn.

(*Continued on page 396*)

A COMPREHENSIVE ENCYCLOPEDIA OF MECHANICAL MOVEMENTS UNPARALLELED IN SCOPE AND USEFULNESS



TYPICAL SUBJECTS COVERED

- Cam Application and Special Cam Designs
- Intermittent Motions from Cams and Gears
- Intermittent Motions from Ratchet and Geneva Mechanisms
- Overload, Tripping and Stop Mechanisms
- Locking, Clamping and Locating Devices
- Reversing Mechanisms of Special Design
- Reciprocating Motions Derived from Cams, Gears and Levers
- Crank-Actuated Reciprocating Mechanisms
- Variable-Stroke Reciprocating Mechanisms
- Mechanisms Which Provide Oscillating Motion
- Mechanisms Providing Combined Linear and Rotary Motions
- Speed-Changing Mechanisms
- Speed-Regulating Mechanisms
- Feed-Regulating, Shifting and Stopping Mechanisms
- Automatic Work Feeding and Transfer Mechanisms
- Feeding and Ejecting Mechanisms for Power Presses
- Hoppers and Hopper Selector Mechanisms for Automatic Machines

The three volumes of INGENIOUS MECHANISMS FOR DESIGNERS AND INVENTORS contain job-tested answers to many of your difficult mechanical design problems . . . accurate, comprehensive and fully illustrated descriptions of unusual mechanical movements developed by experienced inventors and designers.

Each of the three volumes of INGENIOUS MECHANISMS is an independent treatise on the subject of mechanisms. The books are similar in size and general character, but the contents are different. The mechanisms described are grouped into chapters according to general types. Together with the complete index, this arrangement *by function* makes it easy to find the class of movement desired, and enables you to compare mechanisms which are similar in purpose but different in design. In each description you are told plainly and briefly *what* each mechanism consists of, *how* it operates, and the features which make it of special interest. The illustrations are drawn to give you the important and fundamental elements of each mechanism.

A few of the many different types of mechanisms described are listed at the left. Together, the three volumes will provide you with practical solutions to many of your most perplexing mechanical problems. Order one, two, or all three of these volumes today by mailing the convenient order form below. Note time-payment plan and five-day Free inspection offer.

Volume I ..... 536 Pages, 300 Illustrations
Volume II ..... 538 Pages, 303 Illustrations
Volume III ..... 536 Pages, 317 Illustrations

Price: Single Volume, $6.00
Any two volumes 10.00
Three volumes 15.00

Postpaid in U. S. For Canadian or foreign orders, add 90¢ per book.

Use This Convenient Order Form

M-1

THE INDUSTRIAL PRESS
148 Lafayette Street, New York 13, N. Y.

Please send me ☐ Volume I ☐ Volume II ☐ Volume III of INGENIOUS MECHANISMS.

☐ Send books postpaid and ☐ Bill me ☐ Bill Company

☐ I enclose $..... payment in full

☐ I enclose $..... one-third down payment and will pay balance in monthly installments. (One book, two additional installments, two or more books, three additional installments).

NAME .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

POSITION* ..... FIRM* .....

*This information would be appreciated for our private records.

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Challenge Mchry. Co., Grand Haven, Mich.
Cleveland Tapping Machine Co., Canton 6, Ohio.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Kaufman Manufacturing Co., Manitowoc, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3 Ohio.

TAPPING MACHINES, Nut

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

TAPS

Besly-Welles Corp., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Continental Tool Works, Div. Ex-Cell-O. Corp., Detroit 32, Mich.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Winter Bros. Co., Rochester, Mich.
Wood & Spencer Co., 1930 E. 61st St., Cleveland, Ohio.

TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

THREAD CUTTING MACHINERY

Brown & Sharpe Mfg. Co., Providence, R. I.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Eastern Mch. Screw Corp., New Haven, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kaufman Manufacturing Co., Manitowoc, Wis.
Landis Mch. Co., Waynesboro, Pa.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Pratt & Whitney, West Hartford 1, Conn.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

THREAD GAGES

See Gages, Thread.

THREAD GRINDING MACHINES

See Grinding Machines, Thread.

THREAD MILLING MACHINES

Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Waltham Machine Works, Newton St., Waltham, Mass.

THREAD ROLLING MACHINES

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
V & O Press Co., Div., Emhart Mfg. Co., Hudson, N. Y.

TIN AND TERNEPLATES

Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co. Div. Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Besley-Welles Corp., Beloit, Wisc.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOL BITS, Special Alloy

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TOOL GRINDERS

See Grinding Machines for Sharpening, Turning and Planning Tools.

TOOL GRINDING ATTACHMENTS

Detroit Reamer & Tool Co., 2830 E. 7 Mile Rd., Detroit, Mich.

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles 34, Calif.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Lovejoy Tool Co., Springfield, Vt.
Maxwell Co., 420 Broadway, Bedford, Ohio.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Milholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
OK Tool Co., Milford, N. H.
Portage Double Quick Tool Co., 1063 Sweitzer Ave., Akron 11, Ohio.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill. (Turret)
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Western Tool & Mfg. Co., 1640 Wheeler St., Springfield, Ohio.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOLMAKERS' INSTRUMENTS

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

TOOL STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.

TOOLS, Carbide-Tipped

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Atrax Co., Newington, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Colonial Broach Co., Detroit 13, Mich.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Kennametal, Inc., Latrobe, Pa.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Newcomer Products, Latrobe, Pa.
OK Tool Co., Milford, N. H.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Metal Corp., Lexington, Ky.
Whitman & Barnes, 4000 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

TOOLS, Lathe, Shaper and Planer

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

(*Continued on page 398*)



Put yourself in this worker's place . . .

You'd know immediately why new Scott Industrial Wipers are setting a new standard for industrial wiping

Scott Wipers are disposable. A thrown-away wiper carries harmful liquids and metal chips with it, thus protecting the workers from major causes of crippling dermatitis.

Within just a few short months, Scott Industrial Wipers have taken hold *fast.* More and more key men are finding that industrial wiping can be scientific—a regular phase of production.

These strong, absorbent Scott Wipers are designed for almost any wiping job. They are uniform in size, color, and absorbency. One Scott Industrial Wiper can be used several times before being thrown away.

SCOTT PAPER COMPANY

Experience shows that it will be to your advantage to let us make a survey of your individual requirements to see how Scott Industrial Wipers can best fit into your operation. For more information, fill out this coupon or contact your local Scott distributor.

For further information, fill out the coupon and mail to Scott Paper Company, Dept. M-C, Chester, Pa.

Name_____

Position_____

Company_____

Address_____

City_____ State_____

For more information on products advertised, use Inquiry Card, page 247

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Springfield, Vt.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
OK Tool Co., Milford, N. H.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TRANSFER MACHINES, Automatic

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TRANSFORMERS

General Electric Co., Schenectady, N. Y.

TRANSMISSION, Variable Speed

Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4.
Reliance Electric & Engrg. Co., 1047 Ivanhoe Rd., Cleveland 10, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.

TUBE FORMING AND WELDING MACHINES

American Elec. Fusion Corp., 2606 Diversey Ave., W., Chicago, Ill.
Yoder Co., 550 Walworth Ave., Cleveland.

TUBE MILLS

Abbey-Etna Co., 2422 Maplewood Ave., Toledo 10, Ohio.

TUBING, Aluminum

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

TUBING, Brass and Copper

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
American Brass Co., 25 Broadway, New York, N. Y.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

TUBING, Flexible

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

TUBING, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
National Tube Div. U. S. Steel Corp., 525 Wm. Penn Place, Pittsburgh, Pa.
Republic Steel Corp., Steel & Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.

TWIST DRILLS

See Drills, Twist

UNIVERSAL JOINTS

Baush Machine Tool Co., 156 Wasson Ave., Springfield 7, Mass.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

VALVE CONTROLS

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Philadelphia Gear Works (Motorized), Erie Ave. and G St., Philadelphia, Pa.

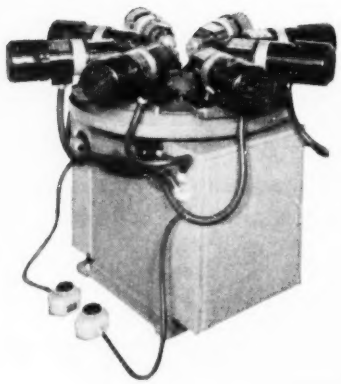
VALVES, Air

Bellows Co., 230 W. Market St., Akron, Ohio.
Hannifin Corp., 1101 S. Kilburn Ave., Chicago, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate, Detroit, Mich.

(*Continued on page* 400)

REDUCE YOUR COST OF RADIAL HOLE-DRILLING!

A Standard Machine Designed for Variety Production



Why build a special machine for drilling radial holes when a standard machine equipped with Govro-Nelson Automatic Drilling Units will, in many cases, perform the work of a special machine that would cost considerably more!

Any number of drilling units up to eight may be employed, the units being movable not only through 360 degrees on the circular table but also movable endwise on riser plates to meet the requirements of the part being drilled.

The machine may also be used for tapping operations with Govro-Nelson Tapping Units. It has a range of 1/32" to 3/8" on drilling operations and 0-80 to 3/8-16 on tapping operations, depending on material and spindle speeds. A single, momentary contact start-button causes all units to operate simultaneously.

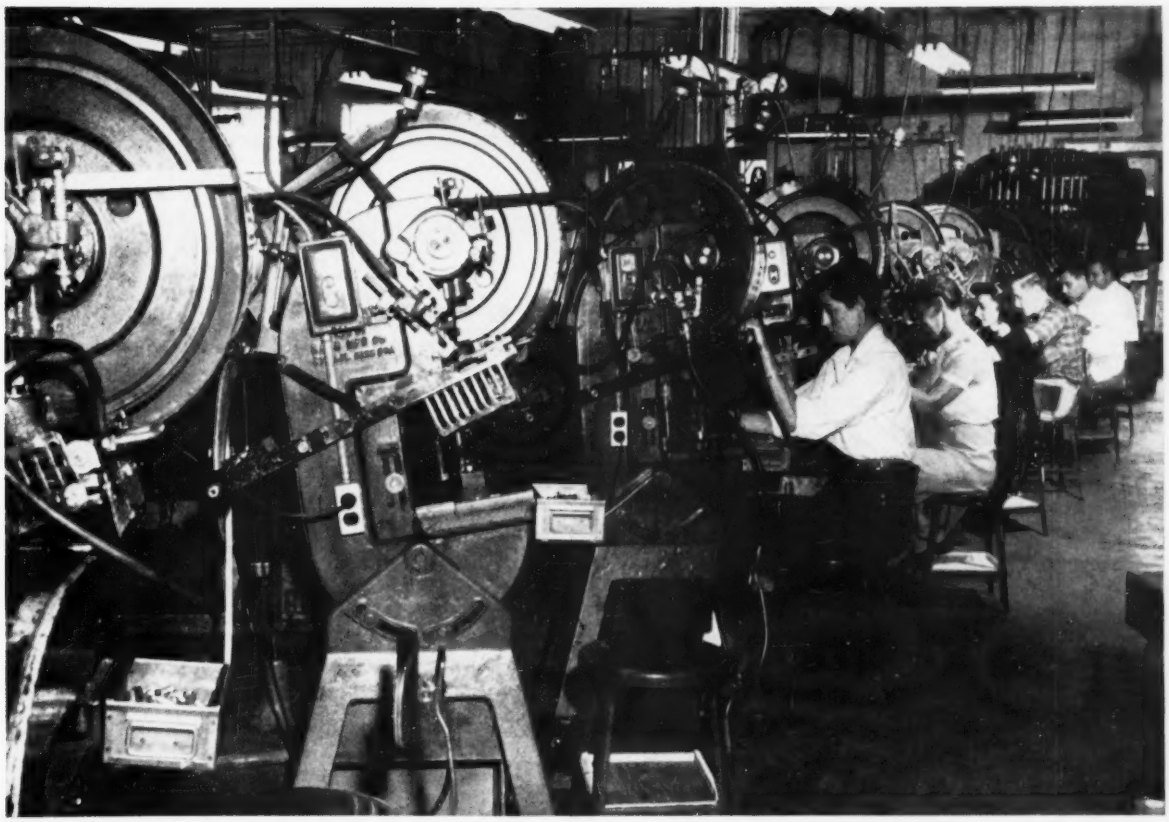
If you are interested in reducing the cost of your radial drilling and tapping operations, write for price and dimensional data.

WRITE FOR Literature

Automatic DRILLING UNIT

GOVRO-NELSON CO.
Machinists of Precision Parts for 30 Years
1933 ANTOINETTE DETROIT 8, MICH

For more information on products advertised, use Inquiry Card, page 247



Some of the 36 Press-Rite Presses at Johnson & Hoffman Manufacturing Company, Mineola, New York



130,000,000 pieces produced on one PRESS-RITE power press

In just four years, one PRESS-RITE Power Press has produced 130,000,000 pieces with a minimum of maintenance . . . and it is still going strong each day. The excellent performance of this press resulted in adding 35 more PRESS-RITE Presses from 5 to 30 ton capacity. The material used runs from .002 to .030 thick with ±.00025 tolerance and includes nickel, stainless steel, aluminum, brass, copper, Beryllium copper, titanium, kovar, rodar, tantalum, nickel silver and precious metals. Strip is fed into press with a tolerance of ±.001.

Results such as these can be yours too! You can increase your production and lower your costs at the same time with PRESS-RITE Power Presses.

FREE Engineering Service

Send us a blueprint or details of your press problems. Our experienced engineers will gladly send you their recommendations on the best method for handling and the equipment required.



Write today for Free bulletin describing the complete line of Press-Rite Presses from 5 to 85 tons capacity.

Sales Service Machine Tool Co. SSMT

PRESS RITE PRESSES • SHAPE RITE SHAPERS • KELLER POWER HACK SAWS

2351 UNIVERSITY AVENUE • ST. PAUL 4, MINNESOTA

VALVES, Hydraulic
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr. Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

VIBRATION INSULATION
American Felt Co., Glenville, Conn.

VISES, Machine
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bellows Co., 250 W. Market, Akron, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hendey Machine Co., Inc., Torrington, Conn.
Homestrand Inc., Larchmont, N. Y.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Universal Engineering Co., Frankenmuth 2, Mich.

VISES, Pipe
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

VISES, Planer and Shaper
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

VISES, Pneumatic
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

VOLTMETERS
General Electric Co., Schenectady, N. Y.

WASHERS, Lock
Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only)
Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

WASHERS, Spring
Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

WELDING AND CUTTING EQUIPMENT Oxyacetylene
Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING AND CUTTING GAGES
Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING EQUIPMENT, Electric Arc
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.
General Electric Co., Schenectady, N. Y., 22801 St. Clair Ave., Cleveland, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

WELDING EQUIPMENT, Electric, Spot, Butt, Seam, Etc.
American Electric Fusion Corp., 2606 Diversey Ave., W. Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.

WELDMENTS
Mahon, R. C., Co., Detroit 34, Mich.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Woods, A. C., & Co., Div. Kropp Forge Co., 1129 Harrison Ave., Rockford, Ill.

WIRE
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Columbia Steel Co. Div., Tennessee Coal Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

WIRE FORMING MACHINERY
Nilson A. H. Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

WIRE NAIL MACHINERY
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

WOODWORKING MACHINERY
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

WORM DRIVES
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

WRENCHES
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Ingersoll-Rand Co. (Impact, Pneumatic, Electric), Phillipsburg, N. J.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Detachable Socket
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Pipe
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Peck, Stowe & Wilcox Co., Southington, Conn.

WRENCHES, Ratchet
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Keller Tool Co., Grand Haven, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

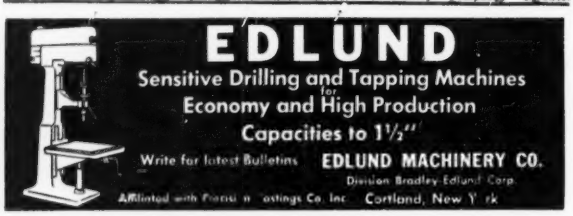
WRENCHES, Tap
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

WRENCHES, Torque Measuring
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Sturtevant, P. A., Co., Addison, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.





See our Advt. on page 417 May 1953



For more information on products advertised, use Inquiry Card, page 247

"If our executives did not read BUSINESS PUBLICATIONS I'd consider them unfit for their jobs"



Col. Willard F. Rockwell,
Chairman of the Board,
Rockwell Manufacturing Company

"We feel the same way about our sales managers," Colonel Rockwell continues. "We expect them to know what is being printed in the business publications and to guide themselves accordingly. Further, we ask our salesmen to keep our home office informed about the comments of our customers on business periodicals."

Like Colonel Rockwell, other business and professional leaders the country over are reading business publications covering their fields of activity. They are getting from these magazines vital information about new products, new methods, new marketing trends, price and distribution changes through the advertising as well as the editorial pages. The Business Press offers a direct route to anyone who has anything to sell to business and professional men.

NBP

For a United Business Press

NATIONAL BUSINESS PUBLICATIONS, INC.

1001 FIFTEENTH STREET, N. W. • WASHINGTON 5, D. C. • STerling 3-7535

The national association of publishers of 161 technical, professional, scientific, industrial, merchandising and marketing magazines, having a combined circulation of 3,524,478 ... audited by either the Audit Bureau of Circulations or Controlled Circulation Audit, Inc.... serving and promoting the Business Press of America... bringing thousands of pages of specialized know-how and advertising to the men who make decisions in the businesses, industries, sciences and professions ... pinpointing your audience in the market of your choice. Write for complete list of NBP publications.



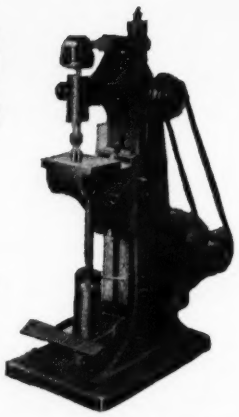
Noiseless Rivet Spinning Machines

GRANT PIONEERS IN RIVETING

OVER 50 YEARS' EXPERIENCE

BOTH SPINNER AND HAMMER TYPES

Single and Multiple Spindles—Vertical and Horizontal—Automatically or Foot-Operated. Handles rivets from the smallest and most delicate up to ¾" diameter.



Rotary Vibrating Riveters

THE GRANT MFG. & MACHINE CO.

N.W. Station **Bridgeport 5, Conn.**



Your production costs—and profits—are materially affected by the efficiency of your production tools. Accepted by industry the world over, Grand Rapids No. 10 and No. 12 Motor-Driven Universal Cutter Grinders meet these exact requirements and are now available for delivery upon short notice. Write us today.

GALLMEYER & LIVINGSTON CO.
305 Straight Ave., Grand Rapids, Mich.

GRAND RAPIDS GRINDERS

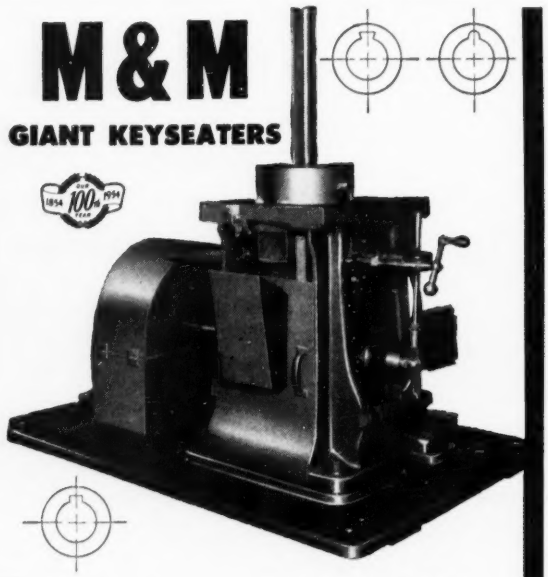
MANUFACTURERS OF SURFACE GRINDERS, CUTTER AND TOOL GRINDERS, TAP AND DRILL GRINDERS

GALLMEYER & LIVINGSTON

PRECISION BEYOND QUESTION

M&M

GIANT KEYSEATERS



M & M Giant Keyseaters, built in a wide range of sizes, speedily and accurately cut internal keyways or splines in the bores of pulleys, gears, fly wheels or any other machine part. Special fixtures and cutters are available for unusual shaped keyways and taper work. Send us your problems today.

MITTS & MERRILL

68

64 Holden Street • SAGINAW, MICHIGAN

ALLEN 1-TON POWER BENCH TYPE PUNCH PRESS

Cuts Costs and Saves Money On Stamping, Forming, Drawing, Etc.

A Rugged, Reliable Press For Small Work



Sturdy, single pin, non-repeat hand lever clutch. V-belt drive. weight 105 lbs.

Overall height—17¼"
Base size—8½"x8½"
Die bed—5½"x8½"
Ram face—1½"x3½"
Ram stroke—¾"
Positive ¾" ram adjustment.

30-DAY MONEY BACK GUARANTEE

Price: $125.00 f.o.b. Clinton, Mo. (less motor)

Full year warranty against defects. Send your order today. Price includes motor bracket, V-belt, motor pulley. Free circular.

ALVA F. ALLEN, DEPT. M, CLINTON, MO.



CAMS

MADE TO YOUR SPEC.

EISLER ENGINEERING CO., INC.
736 SO. 13th ST. NEWARK 3, N. J. U.S.A.

JIG AND FIXTURE DESIGN

A practical book with 382 pages of information on the design and construction of jigs and fixtures for drilling, boring, planing and milling. $4 per copy. Sent on approval.

MACHINERY, 148 Lafayette St., New York 13, N. Y.

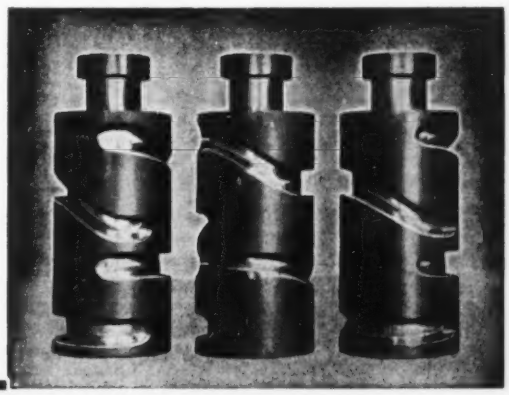
For more information on products advertised, use Inquiry Card, page 247

—Rowbottom for Cams—

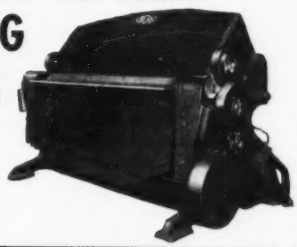
A SPECIALIST SERVICE THAT SAVES TIME!

Our facilities are devoted entirely to cam design and cam making. Our equipment enables us to produce cams of any size or type . . . in any quantity. Our experience has helped thousands of engineers and production men to solve their problems of cam application, cam design and cam manufacture. Give us the job of producing your cams and save valuable production time by releasing skilled mechanics and valuable machines for other work.

THE ROWBOTTOM MACHINE CO.
WATERBURY, CONN.
U. S. A.



STEEL HAND AND POWER
CHICAGO **BENDING BRAKES**



For Single and Quantity Runs Bending Steel Plate and Sheet Metal

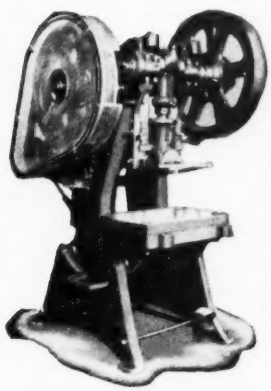
Special Bending Brakes
Double Folder Brakes

DREIS & KRUMP MANUFACTURING COMPANY
CHICAGO
7412 S. Loomis Blvd., Chicago 36, Illinois

SMALL PART **THREAD MILLING . . . AT A PROFIT!**

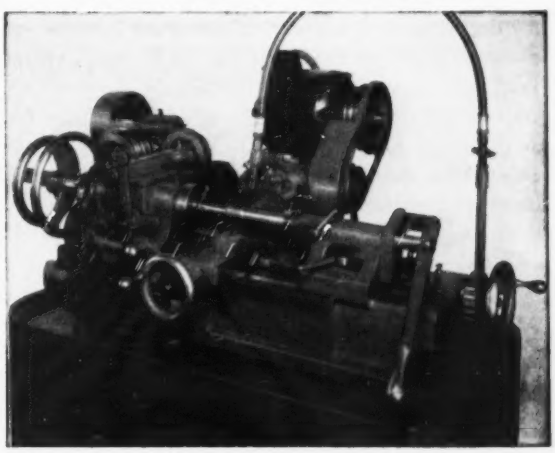
WHEN you want smooth, accurate threads, economically cut at high production speeds—use the Waltham Thread Miller. Automatic, except for loading and unloading, it permits one operator to handle several machines. Low in first cost, low in tooling cost, low in operating cost, the Waltham Thread Miller can be used profitably to thread with precision a great variety of work. Send drawings or samples of threaded parts, and let us send you bulletins describing this and other Waltham machines.

WALTHAM MACHINE WORKS
Newton Street
WALTHAM, MASS.



POWER PRESSES
of all types and sizes

ZEH & HAHNEMANN CO.
182 Vanderpool Street
NEWARK, N. J.



"57,000 Investors in Democracy"



HENRY FORD II

President, Ford Motor Company

"In the most practical way possible—the regular purchase of U.S. Savings Bonds—millions of Americans are demonstrating complete confidence in our form of government. Investors in democracy, they are freely staking their personal security on a fundamental faith in the future of our nation. I am proud that today more than 57,000 Ford Motor Company employees are participating in the Payroll Savings Plan. Last year they bought bonds worth $25,000,000 at face value, and this year the total of their purchases will be even greater. Through their thrift they are helping to keep America strong."

Few investment groups are as important to America as the members of the Ford Payroll Savings Plan. They are *important* in size—57,000 men and women . . . important in buying power—they actually purchase $25,000,000 in Savings Bonds every year . . . and *very* important to our economic stability—"through their thrift they are helping to keep America strong."

"Oh," someone may say, "Ford is a big company and they do things in a big way. It's easy for Ford to get thousands of people to sign up for the Payroll Savings Plan."

It was relatively easy for Ford, and it is easy for any company, large or small, to build a good Payroll Savings Plan *if*—(1) The head of the company recognizes the importance of the Payroll Savings Plan to the employees, the company, and the country; (2) *If* he will show the same degree of personal interest that Mr. Ford takes in the Ford Payroll Savings Plan.

If you would like to match Mr. Ford's Payroll Savings record—percentage-wise, of course—all you have to do is to see to it that a Payroll Savings Application Blank is placed in the hands of every man and woman in your company. It will help, of course, if you remind them, over your signature, that the Payroll Savings Plan is a safe and sure road to personal security.

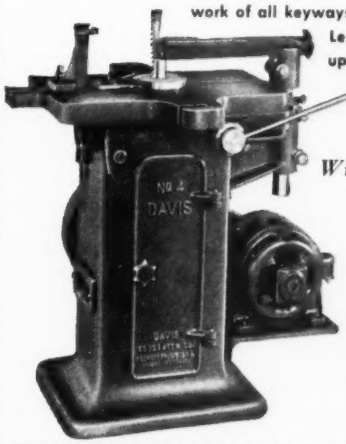
The Savings Bond Division, U.S. Treasury Department, Washington, D. C., is ready to provide all the help you need in the way of Application Blanks, literature, and a complete outline of a simple, person-to-person canvass that will put an application blank in the hands of *every* one of your employees. Your employees will do the rest.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

MACHINERY

DAVIS KEYSEATERS

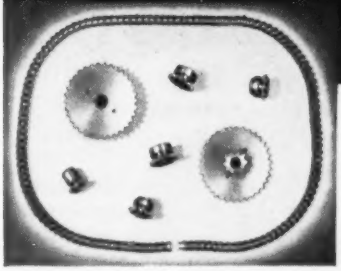
QUICK, LOW COST OPERATION is made possible by the Davis tilting table, which permits even work tapering as much as 3" per foot to be set up and cut quickly. And Davis multiple tooth cutters make quick work of all keyways up to 1" in width. Let us work out set-ups to speed up your production.

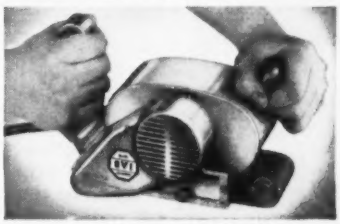


Write for Bulletin

DAVIS KEYSEATER COMPANY
405 EXCHANGE ST.
ROCHESTER 8, N. Y.

Rugged Winzeler Sprockets Help Drive the B.V.I. Sander





Winzeler Ladder Chain Stamped Sprockets bring smooth, dependable performance, long life and *low cost* to the excellent Burgess Belt Sander. Built for toughest sanding jobs, the BVI uses only the sturdiest components.

Cut your costs . . improve quality and performance . . get the uniformity and accuracy only *Winzeler* Stamped Gears can give. Stock and custom dies. Assemblies by staking, brazing, riveting. Production runs on modern high speed equipment assure deliveries *on time!*

***WRITE FOR FREE** folder describing our facilities, tools, assemblies and various Stamped Gears. Includes data and tables. Get samples, ideas, and low prices.*

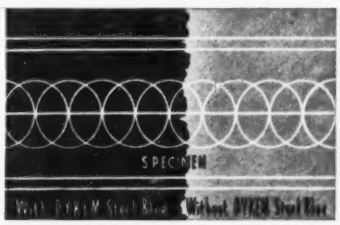
WINZELER *Stamped Gears*

WINZELER MANUFACTURING & TOOL CO.
1712 WEST ARCADE PLACE, CHICAGO 12, ILLINOIS

DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2303R North 11th St., St. Louis 6, Mo.

CUT SCRAPER TIME

END NIGHT CLEANUP & MORNING REBLUING



DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

THE DYKEM CO., 2303R NORTH 11TH ST., ST. LOUIS 6, MO.



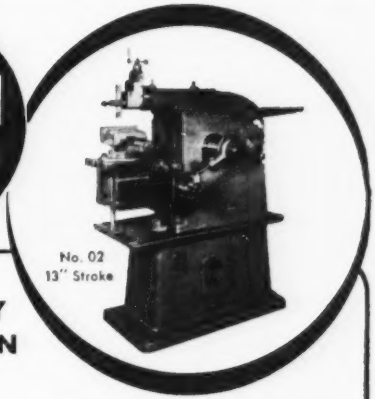
IMPROVE FACING OPERATIONS

ON BORING MILLS - DRILLS - LATHES MILLERS AND RADIALS

M-D facing Head feeds automatically. Lathe tool bit travels radially from center outward or reverse. 10 sizes, 6" to 46" dia. Write for bulletin, prices.

MUMMERT-DIXON CO. 126 Philadelphia St. HANOVER, PA.

PREMA SHAPERS



for CAPACITY PRECISION POWER

The PREMA SHAPER, of recognized Swedish workmanship, will prove to be a valuable addition in any production, tool or job shop. Small and compact in design, yet it soon turns out to be the work horse on jobs within its capacity as ease of set-up and operation quickly become evident. It has 13" maximum stroke adjustable while in operation; 6 power feeds to the table and 6 ram speeds are provided. Drive is by V-belt from 2 HP motor completely enclosed in the column. Its modest price and profit-making capabilities make the PREMA SHAPER most attractive. Service and spare parts are readily available through our dealers.

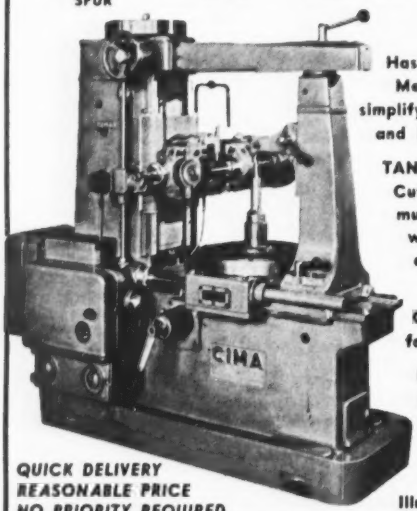
Prompt delivery — Attractive Price — Write for Folder!

austin industrial corp.
76-E MAMARONECK AVE., WHITE PLAINS, N. Y.
Dealers in principal cities
Look for the Austin Seal — your full guarantee of satisfaction!

CIMA UNIVERSAL GEAR HOBBING MACHINE

CAPACITY 20" DIA. 5 D. P.

SPUR · SPIRAL · WORM GEAR · WORM



Has DIFFERENTIAL Mechanism to simplify cutting spiral and helical gears.

TANGENTIAL Feed Cutter Head for multiple-thread worm gears and worms.

Employs CLIMB CUTTING for better finish.

Power Feed and Rapid Return in all directions - Quick set-up.

Write for Illustrated Folder

QUICK DELIVERY
REASONABLE PRICE
NO PRIORITY REQUIRED

GEORGE SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS
200-MA LAFAYETTE ST. • N.Y. 12, N.Y.





GEARED FOR THE NEW YEAR

Diefendorf production has been planned for maximum effectiveness under 1954 conditions.

Talk with Diefendorf engineers about your gear problems. Specification work only. All types. All materials.

DIEFENDORF GEAR CORPORATION

Syracuse, New York

DIEFENDORF GEARS

DOES IT BETTER... DOES IT FASTER

SIMPLEX-M
ABRASIVE BAND GRINDER



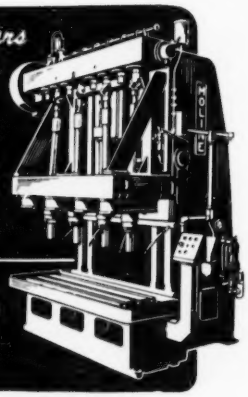
The precision of a machine tool plus the durability of a workhorse. Complete with ½ H.P. Heavy Duty Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING WRITE TODAY

WALLS SALES CORP.
333 Nassau Avenue, Brooklyn 22, N. Y.

MOLINE

For Over 50 Years
"HOLE-HOG"
Specially Designed
MACHINE TOOLS
Have Cut Production Costs for American Industry



MOLINE TOOL CO.
HOLE-HOG
MOLINE, ILLINOIS

No. HU68—Hydraulic rail feed universal joint type multiple spindle drilling machine.

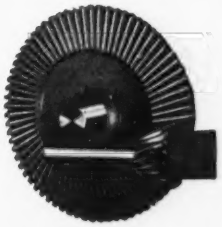
For more information on products advertised, use Inquiry Card, page 247

DESIGNING NEW MACHINES? MODERNIZING OLD MODELS?



Talk your gearing problems over with Bilgram—first! Over 60 years' experience in this specialized field give us the "know-how" . . . . a thoroughly modern plant with specialized equipment (much of it designed by Bilgram Engineers) furnish the "can-do"! Dependable service on ALL types, ALL materials. What are your requirements on Bevel (straight or spiral cut teeth), Ellipticals, Herringbones, Helicals, Racks, Spurs, Hypoids, Worms? Estimates gladly furnished.

BILGRAM GEARS



BILGRAM GEAR & MACHINE WORKS

Manufacturers of Bevel Gear Generators and Chamfering Machines

1217-1235 SPRING GARDEN STREET • PHILADELPHIA 23, PA.



FRANKE FINE PITCH GEARS

***AS* you want them — *WHEN* you want them**

Spurs & Pinions
Helicals & Spirals
Sprockets & Racks
Bevels & Mitres
Worms & Worm Gears
Spline Shafts & Spline Fittings

Specialists in manufacture of Fine Pitch Gears to close tolerances . . . from ordinary commercial grades to the most exacting aircraft specifications.

Send blueprints for proposals and/or engineering collaboration. No obligation to you.

FRANKE GEAR WORKS, INC.
1926 W. COLUMBIA AVE., CHICAGO 26, ILL.



GEARS.. to help *Spur* PRODUCTION

In Stahl's spur gear department, shown above, gears in all sizes are machined and cut to meet the most exacting specifications. Stahl's skill and experience, teamed with the finest precision equipment, produce gears that guarantee top performance. For any type of gear, it will pay you to get a Stahl estimate first.

SPURS TO 72" PD, 1 DP
BEVELS TO 54" PD, 1 DP
SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP
CONTINUOUS-TOOTH HERRINGBONE TO 60" PD, 2 DP
SPROCKETS TO 72" PD, 2½" CP
RACKS TO 20 FT. LONG, 3 DP
SILENT GEARS; RAWHIDE, BAKELITE, FABROIL
HEAT-TREATED, CASE OR FLAME HARDENED GEARS — OF CARBON OR ALLOY STEEL

Stahl

GEAR & MACHINE COMPANY
3901 Hamilton Ave. Cleveland 14, Ohio

an ACCO product



WILSON "ROCKWELL"*... the Jewel of Hardness Testers

● Always the leader . . . recognized and respected. Its quality has been imitated, but never attained. The WILSON "ROCKWELL" sets itself apart—stands alone—as the jewel of Hardness Testers. WILSON accepts the responsibility of leadership.

Be sure. Look to WILSON for the hardness testers you need. Don't be satisfied with anything less than a genuine "ROCKWELL." It may cost less than you think. Write for literature and prices.

ACCO *Trade Mark Registered

WILSON MECHANICAL INSTRUMENT DIVISION
AMERICAN CHAIN & CABLE
230-D Park Avenue, New York 17, N. Y.

WILSON "ROCKWELL" and TUKON Hardness Testers

KEO

CENTER DRILLS



Made of finest high speed steel. Available in all standard sizes. Always in stock for immediate delivery. Specials made to your specifications.

KEYSEAT CUTTERS



High speed. Right hand. ⅛" shank. Diameters from ¼" to 1½". Standard sizes in stock for immediate delivery. Complete set—41 sizes—available in sturdy, hardwood box. Saves time and money, because you always have the size you need.

CENTER REAMERS

High speed steel. Reamers from ¼" to 1" regularly furnished with 60°, 82° or 90° included angle. Specials made to your specifications.



LATHE MANDRELS

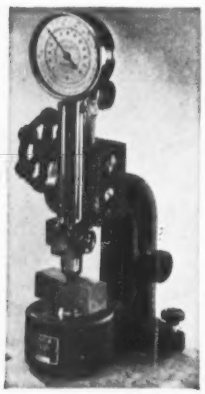


Precision made of tool steel, hardened and accurately ground. Tapered .0005" to the inch. Mandrels from 3/16" to 1" are .0005" undersize at small end, from 1-1/6" to 3", .001" undersize. Immediate delivery.

Write for Literature

Illustrated literature and prices on all KEO Products mailed on request.

KEO CUTTERS
19324 WOODWARD DETROIT 3, MICH.



HARDNESS TESTING
Brinell—Shore—Scale

Included in our improved Portable Scleroscope Model D-1. This efficient single scale tester registers Brinell-Shore values without damage to the work. The old standby for forty-three years.

WRITE FOR CIRCULAR

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
90-35 Van Wyck Expressway, Jamaica, 35, N.Y.

MACHINERY'S MATHEMATICAL TABLES

A special book containing 126 pages of the mathematical tables used daily in drafting-rooms and in many shops, including powers and roots of numbers, circumferences and areas of circles, functions of angles, and logarithms. The tables of squares, cubes, square roots, cube roots and reciprocals cover numbers from 1 to 2000. The tables of circumferences and areas are for diameters ranging from 1/64 to 100. The trigonometric functions advance by minutes and degrees and are given to five decimal places. The logarithm tables are also to five decimal places. All of these tables are the same as the ones in MACHINERY'S HANDBOOK, but this small book is especially adapted to continual usage and quick reference. Send your order and $1.50 to

THE INDUSTRIAL PRESS, 148 Lafayette St., N. Y. 13

W.H.O.* SAYS:



"Don't have FITS over FASTENERS, have fasteners that fit."

For the finest in milled-from-the-bar cap screws—set screws coupling bolts and milled studs

don't get stuck—stick to the ones made by

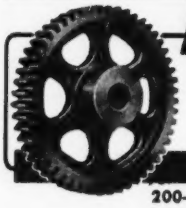
*Wm. H. Ottemiller Co. YORK, PENNA.

GEARS—ALL MAKES . . . Special and Standard

PRECISION GEARS UP TO 200 DIAMETRAL PITCH

All Gears certified for Accuracy Quality and Fine Workmanship

NEW JERSEY GEAR & MFG. CO.
1470 Chestnut Ave. Hillside, N. J.



ATLANTIC GEARS

- SPUR — SPIRAL — WORM
- BEVEL GEARS GENERATED WITH PRECISION ON MODERN EQUIPMENT.
- Send SAMPLE or BLUEPRINT for QUOTATION

Call CAnal 6-1440

ATLANTIC GEAR WORKS Inc.
200-MA LAFAYETTE STREET • NEW YORK 12, N.Y.

For more information on products advertised, use Inquiry Card, page 247

CHAMPION
E-X-P-A-N-D-I-N-G
MANDRELS

Precision Model

Standard Model



give *speed to* every set-up

The flexible sleeve, mounted on tapered arbor, expands automatically to fit the hole. Inserted by hand — no arbor press needed. Always an exact, positive, concentric fit. Locked by a single mallet blow. Unlocked the same way. CHAMPION Expanding Mandrels are used in machine shops around the world. Save time, cut production costs, whether the job calls for machining one piece or a thousand.

Precision Model has expansion range of .010". Available in regular sizes to fit holes from ½" to 3" diam. Holds work to tolerances of .0002" run-out. Guaranteed for precision grinding, turning and milling operations.

Standard Model maintains close tolerances, handles material of any length bore, hard or soft metals — from thin tubes and bushings to heavy castings and forgings. A set of fourteen will fit every hole from ½" to 9½" diam.

CHAMPION *Expanding Mandrels can be made in special shapes and sizes to fit any specifications. Quotations on request. Write for descriptive folder today.*

WESTERN TOOL & MFG. CO., INC.
Dept. 26 Springfield, Ohio



B&RB
PRECISION BEARINGS
are selected for dependability, longer life and greater capacity. Standard sizes carried in stock. Write for general catalog #19.

B R B

THE BALL & ROLLER BEARING CO
DANBURY, CONN.

GEAR

HOBBING
SHAPING
GENERATING
LAPPING
SHAVING

WILLIAMSON GEAR & MACHINE CO.
2606 MARTHA ST., PHILADELPHIA 25, PA. REgent 9-8424

IMPORTANT NOTICE

The Genuine MAUSER **VERNIER CALIPER**
IS NOW MADE OF **STAINLESS STEEL** THROUGHOUT
AND THE FOLLOWING IMPROVEMENTS HAVE BEEN ADDED
• HARDENED PHOSPHOR-BRONZE adjustable gib retains accuracy
• SPECIALLY LONG VERNIER to read thousandths
• 3 GRADUATIONS - 1. 1000" - 1. 128" - 1/10 mm in back



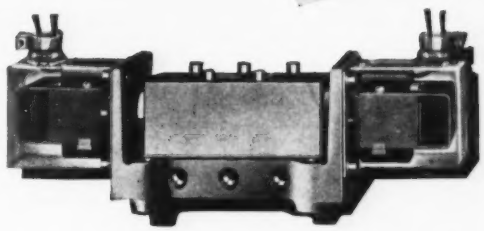
$14.75 PPD

Request illustrated folder showing complete line of MAUSER Toolmakers Calipers, Height Gages, Bevel Protractors and Tool Steels.

GEORGE SCHERR CO., Inc. 200-MA Lafayette St., New York 12, N. Y.

Quick-As-Wink
AIR AND HYDRAULIC
Control Valves

FEATURE THIS MONTH

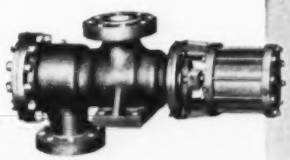


⅛" and ¼" Double Solenoid Valves

Their reduced amperage requirement simplifies electrical circuits

● These valves are extremely simple in design — but ruggedly built — and will give millions of cycles of efficient, trouble-free, dependable operation. For air to 125 psi, vacuum, or low pressure hydraulic service. Up to 300 cycles a minute. Solenoid armature bears directly against the valve plunger eliminating levers, links, pins, etc. Low amperage requirement simplifies the electrical circuit. The valve is reversed by energizing first one solenoid, then the other. The valve and both solenoids are mounted on an aluminum base, and can be removed independently without disturbing the piping. 2-way, 3-way, double 2-way, 4-way and 5-way actions.

also the following

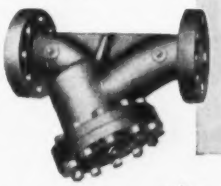


DESCALING VALVES

Specially designed for descaling hot strip and large steel forgings. Widely used. 2" to 6" sizes. Capacities to 1550 Gals./Min. Design eliminates destructive water hammer and reduces hydraulic shock to a minimum.

HIGH PRESSURE STRAINERS

Used ahead of descaling valves to prevent foreign material from plugging spray nozzles causing scale streaks in strip—also in hydraulic lines to protect valves, cylinders, and other machinery. 1½" to 6" sizes. Highly efficient. Easily cleaned.



For Fully Descriptive Data Sheets Write

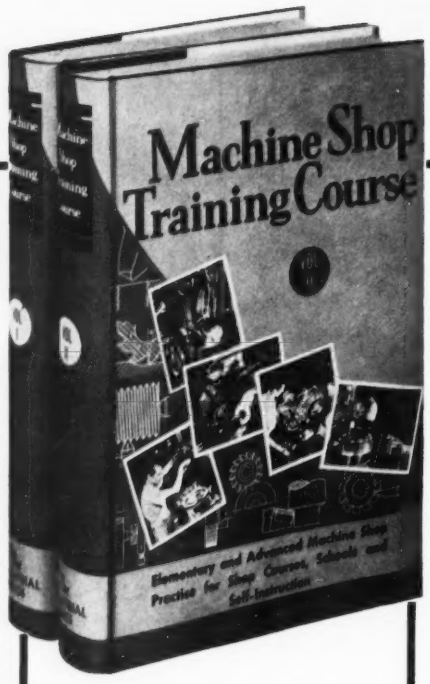
C. B. HUNT & SON, Inc.

Hand, Foot, Lever, Cam, Pilot, Diaphragm and Solenoid Control Valves

1944 EAST PERSHING STREET • SALEM, OHIO

Volume I—570 pages

Principles Underlying All Metal-Cutting Operations
Lathes and Their Principal Mechanical Features
Turning Cylindrical Parts in Lathe
Taper Turning in Lathe and Taper Attachments
Use of Chucks and Faceplates; Drilling and Boring in Lathe
Single-Point Tool Forms and Tool Grinding
Speeds and Feeds for Metal-Cutting
Cooling and Lubricating Fluids for Metal-Cutting
Screw Thread Standards and Their Application
Cutting Screw Threads in the Lathe
How to Calculate Change Gears for Cutting Screw Threads
Measuring Pitch Diameters of Screw Threads
Turret Lathes and Machines of Automatic Type
Vertical Boring and Turning Machines
General Practice in Drilling and Reaming Holes
Precision Methods of Spacing or Locating Holes
Cylinder Boring and Precision Jig Boring
Controlling Degree of Accuracy in Interchangeable Manufacture
Different Classes of Fits for Machine Parts
Calipers, Micrometers and Other Measuring Instruments
Fixed Gages for Checking Sizes of Duplicate Parts
Gaging Tapering Parts and Measuring Angles
Precision Gage-Blocks and Their Application
Generating Plane Surfaces and Angles
Engineering Standards Applied in Machine Building
How to Read Blueprints or Mechanical Drawings
Miscellaneous Rules or Formulas



1124 Pages of Questions and Answers . . . Shop Problems and Solutions

Volume II—554 pages

Cutting Threads in Holes by Tapping
Cutting External Screw Threads with Dies
Forming Screw Threads by Milling and Grinding
Forming Screw Threads by Rolling Process
Planing Process and Its General Application
Milling Flat, Curved and Irregular Surfaces
Dividing Circumferences into Equal Parts by Indexing
Generating Helical Grooves with Index-Head
Operations Requiring Angular Adjustment of Index-Head
Milling Irregular Contours by Reproducing Shape of Model
Cutting Spur Gears with Formed Cutters
Milling Bevel, Helical and Worm-Gears
Cutting Very Large Spur Gears and Bevel Gears
Generating Methods of Forming Gear Teeth
Grinding Cylindrical and Tapering Parts
Surface Grinding and Types of Machines Used
Internal Grinding Including Centerless Method
Grinding Milling Cutters and Reamers
Lapping and Other Precision Finishing Processes
Broaching Internal and External Surfaces
Chipping, Filing, Scraping and Hand Grinding
Tool Steels and Other Metal-Cutting Materials
Heat-Treatment of Steels for Metal-Cutting Tools
Definitions of Shop Terms in General Use

A Course in Machine Shop Practice Unparalleled in Scope and Usefulness

This standard treatise on machine shop practice in two volumes is for the shop man who wants to supplement his own experience with a broad fund of practical knowledge . . . for use as a textbook and guide in shop training courses . . . for technical or trade schools . . . for designers who want the fundamental of machine shop practice . . . for mechanical engineering students. The MACHINE SHOP TRAINING COURSE contains over 1000 pages of questions and answers, carefully selected to deal with the most important elements of machine shop practice, and with other subjects closely allied to work in the shop. The answers in each case cover clearly and fully the essential points, and average about one book page in length. They are packed with useful facts and shop rules, and are accompanied by clear drawings and photographs whenever needed.

Price of complete two-volume set, $8.00
Vol. I or II separately, $5.00 Postpaid in U.S.
Canadian or foreign price, 2 vols., $9.30; single volumes, $5.90

Use This Convenient Order Form Today

THE INDUSTRIAL PRESS, 148 Lafayette St., New York 13, N.Y.

Please send me the MACHINE SHOP TRAINING COURSE, price $8.00 set. If I am not completely satisfied I may return the books within five days and my money will be refunded.

Name . . . . . **Position** . . . . .
Firm . . . . .
Firm Address . . . . .
Home Address* . . . . .
City* . . . . . **Zone*** . . . . . **State*** . . . . .

*Fill in if you want books sent to your home.

Check Method of Payment Desired

☐ I enclose $8.00 payment in full (Canadian or foreign price, $9.30).

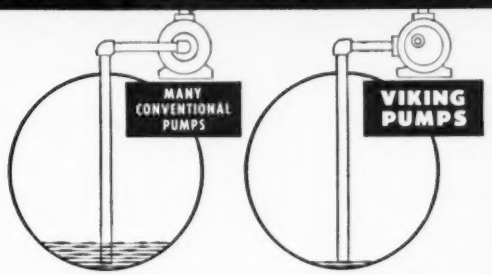
☐ I enclose first payment of $3.00, and will pay the balance in two monthly instalments of $2.50 each.

☐ Bill me.

☐ Bill company.

M-1/54

GETTING TO THE BOTTOM OF THINGS



The difference to you between profit and loss can depend upon the simple, positive action of Viking Rotary Pumps. Their fast, thorough stripping action can mean that you get all you pay for when emptying barrels, tanks and other containers instead of leaving a part of each load. Where many other pumps fail, efficient stripping is possible with Vikings because of the suction lift created by our famous Viking "gear-within-a-gear" pumping principle.

Whether the liquid you want to pump is thick or thin, you will pump more . . . faster with a Viking.

What is your pumping problem? Send it along today and ask for bulletin 548J.

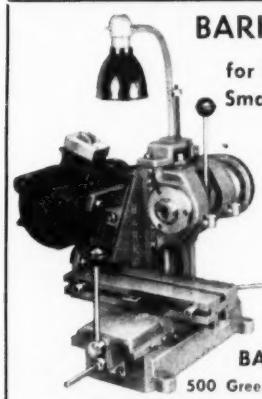
VIKING AN HONORED NAME IN PUMPING

See Our Catalog in SWEET'S

VIKING PUMP COMPANY
CEDAR FALLS, IOWA

BARKER Bench Type MILL

for Production Milling of Small Parts by Unskilled Help.



Massive heavy head allows fast cuts without chatter. Holds close tolerances on big run jobs. Hundreds in use from coast to coast.

EXCLUSIVE 3-WAY TRAVEL

Write for Literature and Complete Details

BARKER ENGINEERING CO.
500 Green Rd. Cleveland 21, Ohio

LUERS

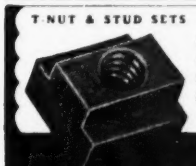
PATENTED CUTTING OFF TOOL HOLDERS
PATENTED CUTTING OFF BLADES

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured by
J. MILTON LUERS, 12 Pine Street, Mt. Clemens, Mich.

Licensed under License Issued by John Milton Luers Patents Inc.

T-NUT & STUD SETS STEP BLOCK SETS PUNCH PRESS SETS



QUARTER TURN SCREWS • KNURLED HEAD SCREWS • DOUBLE END JIG FEET
SCREW TYPE JIG FEET • PRESS TYPE JIG FEET • STAR TYPE HAND KNOBS
SHOULDER SCREWS • CUT THREAD STUDS • TEE NUTS • COUPLING NUTS
ADJUSTABLE STEP BLOCKS • FLANGED NUTS • HEXAGON TYPE HAND KNOBS

SEND FOR FREE CATALOG TODAY

Northwestern
115 HOLLIER AVE., DAYTON 3, OHIO

NEED HYDRAULIC PUMPS IN A HURRY?



Now. . . **you can get hydraulic pumps WHEN YOU NEED THEM!**

Gerotor can deliver from stock . . . immediately . . . any of their standard hydraulic pumps, covering ranges as shown in the table. If you have pump requirements and need immediate service . . . call, wire or write Gerotor today.

Type Pump	G.P.M. Range	P.S.I. Range	R.P.M.
"B"	4-1.5	0-1000	1800
"QDH"	3-12	0-1200	1200
"O"	20-40	0-1000	1200

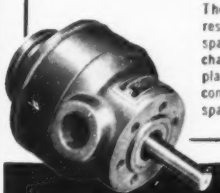
Whatever your need in hydraulic pumps or motors consult the Gerotor May engineers. *Write for free literature.*

GEROTOR MAY CORP. • BOX 86, BALTIMORE 3, MD.

Gerotor is not just a name . . . it's the principle of the thing



The two Gerotors revolve at different speeds, resulting in a continuous opening and closing of spaces as shown in this diagram. Follow the changing position of tooth #1 as rotation takes place. Note its relation to space #2. As rotation continues, tooth #1 gradually displaces oil from space #2, thus creating pressure.



GEROTOR
HYDRAULIC PUMPS & MOTORS

Classified and Re-Sale Section

eastern Rebuilt Machine Tools

THE SIGN OF QUALITY

THE MARK OF DEPENDABILITY

PLAIN CYLINDRICAL GRINDERS

6x15" Cincinnati Plain Hydraulic, m.d.
6x18" Cincinnati Model EA, m.d.
6x18" Landis Type C Hydraulic, m.d., late
6x30" Cincinnati Hydraulic, m.d.
10x18" Cincinnati Model EA, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis, m.d.
12x96" Landis Plain Self-Contained, m.d.
14x18" Cincinnati Plain Self-Contained, m.d.
14x48" Cincinnati Plain Self-Contained, m.d.
14x52" Norton, motorized
16x72" Landis Plain, m.d.
16" raised to 26" x 72" Type C, Norton, m.d.
No. 20—10x18" Brown & Sharpe, m.d.
20x120" Landis Plain Self-Contained, m.d.

EMERY GRINDERS

3 H.P. Baldor Emery Grinder, Pedestal Type
#516 Mummert & Dixon Radial Emery Grinder, m.d., 5 H.P. motor

UNIVERSAL CYLINDRICAL GRINDERS

No. 3 Brown & Sharpe Universal Grinder, m.d.
6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d., latest
16x24" Cincinnati—Self-Contained, m.d.
12x48" Norton Universal, m.d., latest

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., 11-18" spindles
No. 55 Heald, m.d., 15-24" spindles
No. 73 Heald Cylinder Grinders, brand new, m.d.
Model FG Micro Cylinder Grinder, m.d.

SURFACE GRINDERS

No. 2B Brown & Sharpe, m.d.
Arter Model A-1-8" Rotary, m.d., latest
No. 121 Hanchett Production Face Grinder, type BD, m.d.
No. 22—12" Heald Rotary, m.d.
No. 33 Abrasive Vertical, m.d.
No. 260—16" Heald Rotary, belt
14" Pratt & Whitney Vertical, m.d.
Model DA—12" O.S. Walker, m.d., latest
Oliver Surface Grinder

INTERNAL GRINDERS

Model 5Y Bryant, m.d.
No. 16—16" Bryant, m.d., Hydraulic Hole Grinder
No. 16CR16 Bryant, m.d., latest
No. 18—22" Byrant, m.d., latest
No. 16—38" Byrant, m.d., latest
No. 24P—26" Bryant, m.d.
No. 24—21" Bryant, m.d.
No. 44 Heald Facing Type Boremetic, m.d.
No. 72 Heald Sizematic, m.d.
No. 72A Heald Sizematic "Duplex," m.d.
No. 72A Heald Gagematic, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72A5 Heald Sizematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 73 Heald Airplane, m.d., latest, new
No. 74 Heald, m.d.
No. 81 Heald Gagematic, Sizematic, m.d.
No. 649—16" Van Norman Automatic Oscillating Radius, m.d., latest
No. 5 Bryant, m.d., latest

TOOL & CUTTER GRINDERS

#2 LeBlond Tool & Cutter Grinder
Gisholt Universal Tool Grinder, belt
Union Twist Drill & Cutter Grinder
Type 05D Sellers Drill Grinder, m.d.
No. 0-2 GP Sellers Drill Point Thinning Machine, m.d.
Grand Rapids Tap Grinder, style 12M
Gleason Cutter, belt drive
No. 2A Wm. Sellers Universal Tool Grinder, m.d.
No. 2B Sellers Wet Grinder, m.d.
No. 2 Lumsden Oscillating Tool Grinder, belted m.d.
No. 4T Sellers Tool, m.d., latest
No. 5T Sellers Tool, m.d.
No. 1 J & B Tap Grinder, m.d.
Pratt & Whitney Deep Hole Drill Sharpener, m.d., latest
Gould & Eberhardt Gear Cutter Grinder, 2 step cone pulley belt drive
#44 Excello Carbide, 6" dia. wheels, late

HONING MACHINES

H1 Micromatic Horizontal Hydrohoner, m.d.
H2 Micromatic Horizontal Hydrohoner, m.d.
H4 Micromatic Horizontal Hydrohoner, m.d.
No. 6 Barnes Twin Spindle
Model #182 Barnesdrill Hone, m.d., latest
Model 306H Barnes, single spindle

We carry an average stock of 2,000 machines. Let us quote on your requirements.

THE EASTERN MACHINERY COMPANY
3068 Tennessee Avenue, Cincinnati 22, Ohio • MElrose 1241 • Cable Address EMCO

You pay no more at MOREY ... you just get more

1000 LATE TYPE TOOLS IN STOCK

BROACHES

CINCINNATI 1-30 Duplex Vertical, Hydraulic; late.
COLONIAL VG-1-10-48 Vertical, Hydraulic; late.
LAPOINTE 10" x 54" Vertical; cap. 20,000#; NEW 1947.
OILGEAR 3XA Horizontal, Hydraulic; late.

GEAR CUTTING EQUIPMENT:

BROWN & SHARPE #6-72" Auto. Cutter; M.D.
CROSS #1, 40, 45 Gear Tooth Rounder; N.D.
DETROIT type GG-35 Gear Grinder; late.
FELLOWS #61A, 612, 75, 7A, 77, 48. H.S. Gear Shapers; late.
FELLOWS 13LS Lapper, motor-drive; late.
GLEASON 12" Straight Bevel Gen.; late.
GLEASON 3" spiral bevel gear gen.; M.D.
GLEASON 24", 37" Bevel gear planers; M.D.
GLEASON #6 Revacycle' late type.
GLEASON #13 Hypoid cutter sharpener; late.
GLEASON #14 Spiral bevel Hypoid gear grinder; late.
GLEASON Model 17, Hypoid, Spiral Grinder; M.D. late.
GOULD & EBERHARDT 12H Gear Hobber; late.
GOULD & EBERHARDT 18H Gear Hobber; M.D.
GOULD & EBERHARDT #36BM 3-spindle auto. gear rougher; M.D.
MICHIGAN Model 854 gear shaver, rack type; M.D.
MICHIGAN Gear Finisher, M.D., 862-24-A; late.
PRATT & WHITNEY 10" Gear Grinder; late.

LATHES, Turret:

GISHOLT 1L Univ. saddle type, Timken, M.D., late.
GISHOLT 2L High Production, Timken, M.D., late.
MOREY #2 ram type, Timken; late.
WARNER & SWASEY 2A Univ. Preselector head; late.

MILLING MACHINES—Thread

HALL style D Planetary; Late.
LEES BRADNER Model HT, 12" x 36" centers, late.
MOREY 12" x 30" centers, late type.

MILLING MACHINES—Manufacturing

GOULD & EBERHARDT 25 Cent. type; M.D.
INGERSOLL 32 x 24 x 16' Planer Type; 2 hds.; M.D.
INGERSOLL 30 x 24 12' Adj. Rail Slab; M.D.
TAYLOR & FENN M-80 Duplex Spline; Late.

MILLING MACHINES—Plain

CINCINNATI 1-18 Automatic, Timken, late type
CINCINNATI #4, PRT; Timken; late type
KEARNEY & TRECKER Mod. 2HL; M.D.; Late.
KEARNEY & TRECKER Model 3CMS; PRT; Timken.
KEARNEY & TRECKER 4H Plain, Timken late type.
ROCKFORD No. 3 Rigid Mill, Motor Drive.
STARR No. 2 Table 13" x 55", late type.

MILLING MACHINES—Universal

CINCINNATI No. 3 Univ., dial type, Timken, M.D.
RICHMOND No. 2 light type; late.
VAN NORMAN #26 Ram Type Miller; late type.
VAN NORMAN #36 Ram Type Miller; late type.
VAN NORMAN #36 SU Ram type Miller; late type.

MILLING MACHINES—Vertical

CINCINNATI #3 Vertical; Timken; late type.
KEARNEY & TRECKER 4CH Knee type; late.
CINCINNATI 0-8 Vertical, Timken, late type.
KEARNEY & TRECKER 3H Vertical, Timken, late.
KEARNEY & TRECKER 3K High Speed, Timken.

GRINDERS—Internal

BRYANT, No. 3 and 5 Internal; hydraulic; late.
BRYANT No. 16-C-16 Internal; hydraulic; late.
BRYANT No. 24 Internal; hydraulic; late.
CHURCHILL No. 3 Internal; 8" stroke; late.
HEALD No. 70A Internal, M.D., late.
HEALD No. 81 pl. chuck type, Internal; M.D.
HEALD No. 72A3 and 72A5 Plain internal; late type.
HEALD No. 72A5 "Gagematic" internal; late.
HEALD No. 78 internal, centerless, M.D.

GRINDERS—Cylindrical, Plain & Universal

BROWN & SHARPE No. 3 Universal; late type.
BROWN & SHARPE No. 5, 3"x12"; Plain; late.
LANDIS 10"x18" type "C" Plain; hydraulic; late.
NORTON 4"x18" model CTU Plain; year 1953.
NORTON 6"x18" Type "C" Plunge; late.
NORTON 10"x48" type "C" Hydraulic; Pl. Cyl.; late.
VAN NORMAN No. 666, 48" centres, crankshaft; late.

GRINDERS, Surface

ABRASIVE No. 34, 8"x24" table; late type.
ARTER 8" Rotary, motor drive.
BILLITER & KLUNTZ 48"x196" Way, Grinder; M.D.
HEALD No. 22 Rotary, 12" chuck; M.D., late.
NORTON 6"x18" Vertical Spindle; late type.

Complete Catalog on Request

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
410-A BROOME ST. • NEW YORK 13, N.Y.
Tel.: CAnal 6-7400 • Cable: WOODWORK, N.Y.



The world's best . . . one-piece, drop-forged—not welded—of mild carbon steel, heat-treated, with head accurately milled for standard tables on lathes, planers, boring mills, milling machines. Integral washer and nut. Sizes: up to 30". Typical direct prices for 10" lengths: ½—$1.36; ⅝—$1.36; ¾—$1.58; ⅞—$1.89. Write for price list.
THE O K TOOL COMPANY, INC., MILFORD 6, N. H.

Contact Manufacturing Facilities Available For

CUSTOM-BUILT MEDIUM AND HEAVY MACHINERY

Steel Fabricating Shop—Grey Iron Foundry Pattern Shop—Machine Shop

OPEN TIME NOW

QUALITY WORKMANSHIP—PROMPT SERVICE
Engineering Service Available
For Complete Information, Write, Wire or Phone
ROBERT HOLMES & BROS., INC.
4-D Junction Ave., Danville, Illinois

Classified and Re-Sale Section

CHECK THIS LIST

AUTOMATIC. 1¼" and 1½" 8-spindle Conomatics
AUTOMATIC. 11" Model B Goss & DeLeeuw 5-spindle chucker
BALANCER. Gisholt Static
BORER. 6-spindle Foote Burt vertical
BORER. Moline Holehog
BROACH. 10 ton 48" American horizontal hydraulic
BROACH. 10 ton No. V-42 American semi-automatic vertical
DRILL. Natco double end horizontal
DRILL. No. B25OH Natco vertical hydraulic
GROOVER. No. 1 Fisher oil
GEAR GENERATOR. 4" Gleason spiral bevel
GEAR HOBBER. No. 3 Barber Colman
GEAR HOBBER. No. 36H Gould & Eberhardt
GEAR HOBBER. 72" S. & S. universal
GEAR ROUNDER. No. 60 Cross gear tooth rounder
GEAR CUTTER. 100" x 24" Newark No. 7 spur gear
GEAR GRINDER. 10" Pratt & Whitney hydraulic
GRINDER, CENTERLESS. No. 2 Cincinnati plain and Filmatic
GRINDER, CYLINDRICAL. 10" x 72" Norton Type A and C
GRINDER, CYLINDRICAL. 16" x 26" x 72" Norton type C hydraulic
GRINDER, CYLINDRICAL. 16" x 96" Landis plain, type B
GRINDER, SURFACE. No. 5 Brown & Sharpe hydraulic
GRINDER, SURFACE. 8" x 22" No. 3 Abrasive
GRINDER, SURFACE. 12" x 48" Model 300 Hanchett vert. spindle
GRINDER. Cincinnati face milling cutter grinder
GRINDER. 38" Coval Hanchett Model GK-36 knife
LATHE. 14" (60½" x 42" centers, 8' bed) Hendey geared head
LATHE. 15" x 30" centers 5' bed Sebastian geared head
LATHE. 18" x 8' Cisco geared head
LATHE. 24" x 12', 13', and 14' bed American geared head
LATHE. 20"-40" LeBlond heavy duty gap
MILL. 12" and 18" Cincinnati automatic manufacturing
MILL. 24" Cincinnati automatic duplex
MILL. 4-36 Cincinnati hydromatic
MILL. 4-48 Cincinnati hydromatic
MILL. No. 3 Sundstrand Rigidmil
MILL. No. 3 Sundstrand Rigidmil

MILES MACHINERY CO.
2025 E. Genesee Avenue
Telephone—Saginaw 2-3105
Saginaw, Michigan

DEGREASER WANTED

Detrex, Blakeslee or other gas fired degreaser, approximately 11 ft. by 5 ft. by 4 ft. Must be in good operating condition. Write or telephone H. S. Boorman, Wall Wire Products Co., Plymouth, Mich. Telephone Plymouth 1190.

AUTOMATIC SCREW MACHINE FOREMAN

Old established screw machine firm in Cleveland area, producing small parts on jobbing basis, requires man to supervise Automatic Screw Machine Department consisting of single and multiple spindle Acme-Gridleys, and multiple spindle New Britain-Gridleys. Modern Equipment. Excellent opportunity. Write, stating qualifications. Address Box No. 675, MACHINERY, 148 Lafayette St., New York 13, N.Y.

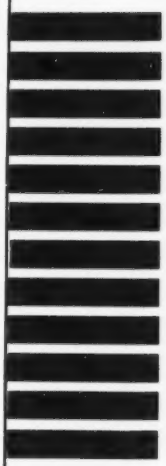
DESIGN DRAFTSMAN

For long established punch press division of an expanding and progressive company. Experienced in design of automatic equipment-preferably with punch press feeding and tooling. Send resume and full details to:

V & O PRESS DIVISION
EMHART MFG. COMPANY
HUDSON, NEW YORK

WANTED: Horizontal Boring Mill, Floor type, 3½" or 4" bar or larger; 8-10' horizontal travel, 5-6' vertical travel. THE FOSTER COMPANY, Stevensville, Michigan.

FOR SALE



Two Cleveland Single Spindle Automatic Turret Machines, 2½"—Model A—Serial Nos. 43276-146 and 43272-146. *Both new in 1946.* Excellent condition. Fully tooled for general machine shop work including:

53 sets of round collets. All sizes from ⅜" to 2½" by increments of 1/16" plus many duplicates. 9 Sets of hex collets. 14 Front cross slide tools. 10 Rear cross slide tools. Numerous spare parts. Complete list of tooling furnished on request.

Both machines may be seen in operation in our plant.

STOW MANUFACTURING CO., 111 Shear St., Binghamton, N. Y.

CUT TOOL COSTS broken tools made like new again with **NU-TANGS**

Twisted or broken tangs replaced at low costs on any tool with a Morse Taper (sizes 1 to 6)
Hundreds of leading industries save money on drills, reamers, countersinks, cutters, drivers, the NU-TANG way.
Prompt delivery. Send for prices—or send tools for repairs. All work guaranteed.



NO WELDING! NO SHORTENING! NO SLEEVES! NO DISTORTION!
GUARANTEED STRONG AS NEW!



Send them to us like this! ★ *Patent No. 2,512,033* *We return them like this!*

NU-TANGS INC. 1335 Bates Avenue Cincinnati 25, Ohio

WANTED WELDER

25 or 30 KVA Spot Welder. Must be in good condition.

Write to:

A. GALLAGHER
Purchasing Agent
WALL WIRE PRODUCTS CO.
Plymouth, Michigan

GRINDING FOREMAN

Old established screw machine firm in Cleveland area, producing small parts on jobbing basis, requires man to supervise Grinding Department consisting of modern external and internal equipment, specializing in production of aircraft parts. Excellent opportunity. Write, stating qualifications. Address Box No. 676, MACHINERY, 148 Lafayette St., New York 13, N.Y.

REPRESENTATION AVAILABLE

International Department, expertly staffed, long established firm interested in Machinery, Industrial Equipment for exclusive world or territorial representation. CHARLES HARDY, INC., 420 Lexington Avenue, New York 17, N.Y.

MACHINE TOOLS

#2 Cincinnati Centerless Grinder Filmatic
Bearing Motor Driven Thru Feed
Work Rest Late Type
1000 MACHINE TOOLS "IN STOCK"

FALK MACHINERY CO.
18 Ward Street — BA 5887 — Rochester, N. Y.

MACHINE MANUFACTURER

in New Jersey, well equipped, capacity 125 men, looking for some patented or mass production item, to buy outright or royalty basis. Box No. 674, MACHINERY, 148 Lafayette St., New York 13, N.Y.

JIG AND FIXTURE DESIGN

A practical book with 382 pages of information on the design and construction of jigs and fixtures for drilling, boring, planing and milling. $4 per copy. Sent on approval.

MACHINERY
148 Lafayette Street, New York 13, N. Y.

for

HAND PROFILING
MILLING
SLOTTING
RECESSING
and ROUTING
You can push your
PRODUCTION COSTS *'way down*

with this new, improved

Wade no. 45

PROFILING MACHINE



FOR PRECISION OPERATIONS
on such parts as those listed here, you will find that the Wade No. 45 Profiling Machine "has everything!" It is remarkably easy to operate, compact, heavy, and rugged. It has plenty of power and 8 different speeds. Can be bench mounted, or will be furnished with a sturdy metal pedestal cabinet.

- WATCH & CLOCK PLATES
- CLOCK MECHANISMS
- MECHANICAL TIME FUSES ON SMALL FIREARMS
- REVOLVERS, RIFLES
- SMALL DOVETAILS, SUCH AS FIREARM SIGHTS
- RANGE FINDER PARTS
- GUN SIGHTS
- CYLINDER LOCKS
- TEXTILE SHUTTLES
- SMALL TEXTILE MACHINERY PARTS
- METERS, DIAL INDICATORS
- TYPEWRITER, ADDING MACHINE PLATES AND LEVERS
- KNITTING MACHINE DIALS AND CAMS
- OPTICAL INSTRUMENT PARTS
- CAMERA PARTS — CLAMPS, UNIVERSAL JOINTS, SMALL CAMS OF ALL KINDS

Descriptive folder and prices on request. | *Write to 52 River St.*

THE WADE TOOL CO.
WALTHAM 54, MASS., U. S. A.

MAKERS OF PRECISION TOOLS FOR AMERICAN INDUSTRY

For more information on products advertised, use Inquiry Card, page 247

ALPHABETICAL INDEX OF ADVERTISERS

A

Abbey Etna Co. 119
Abrasive Machine Tool Co. .. 278
Adcock & Shipley Ltd. 379
Aetna Ball & Roller Bearing Co. 149
Allegheny Ludlum Steel Corp. 102
Allen-Bradley Co. Insert bet. 148-149
Allen Industries, Alva F. 402
Allied Products Corp. 357
American Broach & Mch. Co. ..... Insert 75-90
American Chain & Cable 371-408
American Felt Co. 317
American Sip Co, ... 42
American Society of Tool Engineers 323
American Steel Foundries 305
American Tool Works Co. 145
Ames, B. C., Co. 310
Amgears, Inc. 381
Anderson Bros. Mfg. Co. Insert 75-90
Armstrong-Blum Mfg. Co. 142
Armstrong Bros. Tool Co. Front Cover
Atlantic Gear Works, Inc 408
Austin Industrial Corp. 405
Avey Drilling Machine Co. 325

B

Baker Bros., Inc. 293
Baldwin-Lima-Hamilton Corp. 50-51-120-121-282-283
Ball & Roller Bearing Co. 409
Barber-Colman Co. .. Insert 75-90
Bardons & Oliver, Inc. 122
Barker Engrg. Co. 411
Barnes Drill Co. ..... Insert 75-90
Barnes, John S. Co. Insert 75-90
Baush Machine Tool Co. 319
Beaver Tool & Engrg. Co. 327
Besly-Welles Corp. 274
Bethlehem Steel Co. 93-106
Bilgram Gear & Mch. Wks. .. 407
Black & Decker Mfg. Co. 391
Blanchard Machine Co. 48
Bliss, E. W. Co. 38-39
Brad Foote Gear Works, Inc. 56-57
Brown & Sharpe Mfg. Co. Insert 237-238
Bryant Chucking Grinder Co. 368-369-374-375
Bryant Machinery & Engineering Co. 255
Buffalo Forge Co. 140
Bullard Co. ..... Insert 44-45

C

Cameron Iron Wks., Inc. 309
Campbell Machine Div. American Chain & Cable 371
Carboloy Dept. of General Electric Co. 94-95-101
Carborundum Co. 134-135
Carpenter Steel Co. 104
Challenge Mchy. Co. 324
Chambersburg Engrg. Co. 138
Chicago-Latrobe Twist Drill Wks. 366
Chicago Pneumatic Tool Co. 246
Cincinnati Bickford Tool Co. 241
Cincinnati Gear Co. 372
Cincinnati Milling Machine Co. 6-7
Cincinnati Milling Machine Co., Grinding Wheels Div. 62-63
Cincinnati Milling Machine Co., Hydroform Div. 107
Cincinnati Milling Products Div., Cincinnati Milling Machine Co. 31
Cincinnati Shaper Co. 112-113
Cities Service Oil Co. 299
Clarkson, Inc. 350
Classified Advts. 412-413
Clearing Machine Corp. Insert 72-73
Cleveland Crane & Engrg. Co. 36
Cleveland Twist Drill Co. Insert 279
Clinton Machine Co., Metalmaster Div. 263
Columbia Tool Steel Co. 376
Columbus Die-Tool & Mch. Co. 367
Cone Automatic Mch. Co., Inc. 125
Consolidated Machine Tool Corp. 28-29
Cross Company 252
Crucible Steel Co. of America 91
Cumberland Steel Co. 92

D

Danly Mch. Specialties, Inc. 123-341
Davis Keyseater Co. 405
Dearborn Gage Co. 330
Delta Power Tool Div., Rockwell Mfg. Co. 288-289
Denison Engineering Co. 118
Detroit Broach Co. 66-67
Detroit Reamer & Tool Co. .. 136
Diefendorf Gear Corp. 406
Dreis & Krump Mfg. Co. 403
du Mont Corp. 372-376
Dykem Co. 405

E

Eastern Mch. Screw Corp. 400
Eastern Machinery Co. 412
Eastman Kodak Co. 71
Edlund Machinery Co. 400
Eisler Engineering Co., Inc. 402
Ekstrom-Carlson & Co. Insert 75-90
Ellstrom Standards Div., Dearborn Gage Co. 330
Ettco Tool Co., Inc. 43
Ex-Cell-O Corporation 258

F

Falk Machinery Co. 413
Farquhar, A. B., Div., Oliver Corp. 308
Farrel-Birmingham Co., Inc. 337
Farval Corp. 37
Federal Press Co. 339
Federal Products Corp. 58-59
Fellows Gear Shaper Co. 4-5
Firth Sterling, Inc. 393
Foote-Burt Company 30
Formsprag Co. 61
Franke Gear Works, Inc. 407

G

Gallmeyer & Livingston Co. 402
Gardner Machine Co. 27
Garlock Packing Co. 286
General Electric Co. Insert 276-277-281
Geometric Tool Co. Div., Greenfield Tap & Die Corp. Insert 139
Gerotor May Corp. 411
Giddings & Lewis Machine Tool Co. 20-21
Gisholt Machine Co. Insert bet. 32-35
Gleason Works 307
Gorham Tool Co. 298
Gorton, George, Mch. Co. 47
Goss & DeLeeuw Mch. Co. 292
Govro-Nelson Co. 398
Grant Mfg. & Machine Co. .. 402
Gray, G. A., Co. 53
Greenlee Bros. & Co. Insert 75-90
Grob Brothers 407

H

Hamilton Tool Co. 265
Hammond Machinery Builders, Inc. 362
Hanchett Magna-Lock Corp. 316
Hannifin Corporation 303
Hanson-Whitney Div. of the Whitney Chain Co. 297
Hardinge Brothers, Inc. 154
Hartford Special Mchry. Co. 342
Heald Machine Co. Inside Front Cover
Hendey Machine Co., Inc. 52
Hill Acme Co. 32
Hoglund Engrg. & Mfg. Co. 363
Horton Chuck 346
Hunt, C. B., & Son, Inc. 409
Hyatt Bearings Div., General Motors Corp. 353

I

Illinois Gear & Mch. Co. 111
Industrial Filtration Co. 385
Industrial Press 395-410
Ingersoll Milling Machine Co. ..... Insert 75-90

J

Jahn, B., Mfg. Co. 306
Johnson Bronze Co. 294
Johnson Mch. & Press Corp. 344
Johnson Mfg. Corp. 304
Jones & Lamson Machine Co. 128-273

K

Kearney & Trecker Corp. 16-17-132
Keller Tool Co. 302
Keo Cutters 408
Kennametal, Inc. 318
King Mch. Tool Div. American Steel Fdries 305
Kingsbury Mch. Tool Corp. 130-131

L

L & J Press Corp. 346
Lake Erie Engrg. Corp. 348-349
Laminated Shim Co., Inc. 326
Landis Machine Co. 2-3
Landis Tool Co. 10-11
Lapointe Machine Tool Co. .. 387
Le Blond, R. K., Machine Tool Co. 150-151
Lehmann Machine Co. 355
Leland-Gifford Co. 64
Linde Air Products Co. Div. Union Carbide and Carbon Corp. 96
Lincoln Electric Co. 46
Link-Belt Co. 26
Lipe-Rollway Corp. 370
Lodge & Shipley Co. 267
Logan Engrg. Co. 359
Luers, J. Milton 411

M

Madison-Kipp Corp. 100
Materials Section 91-106
Mattison Machine Works Insert 75-90
Metal Carbides Corp. 406
Miles Machinery Co. 413
Millholland, W. K., Machinery Co., Inc. 352
Mitts & Merrill 402
Modern Mch. Tool Co. 386
Moline Tool Co. 406
Moore Special Tool Co., Inc. 74
Morey Machinery Co., Inc. 315-412
Morgan Engineering Co. 400
Motch & Merryweather Mchry. Co. 146-147
Mummert-Dixon Co. 405

N

National Acme Co. 365
National Broach & Mch. Co. 133
National Business Publications, Inc. 401
National Forge & Ordnance Co. 99
National Tool Co. 343
National Tube Div., U. S. Steel Corp. 105
National Twist Drill & Tool Co. 15
New Britain Mch. Co. The, Inside Back Cover
Newcomer Products, Inc. 324
New Departure Div. General Motors 351
New Jersey Gear & Mfg. Co. 408
Niagara Machine & Tool Works 108-109
Nicholson File Co. 313
Nichols-Morris Corp. 54
Northwestern Tool & Engineering Co. 411
Norton Company 18-19-114-115

O

Oakite Products, Inc. 103
Ohio Crankshaft Co. 41
Oilgear Co. 335
O K Tool Co., Inc. 412
Oliver Instrument Co. 328
Onsrud Machine Wks. Inc. 311
Orange Roller Bearing Co. 321
Osborn Mfg. Co. 60
Ottemiller, William H., Co. .. 408

ALPHABETICAL INDEX OF ADVERTISERS—Continued

P

Pangborn Corporation 416
Peerless Production Co. 251
Perkins Mch. & Gear Co. 336
Philadelphia Gear Wks., Inc. 49
Pines Engineering Co., Inc. 55
Pope Mchry Corp. 143
Pratt & Whitney Div. Niles-Bement-Pond Co. 270-271
Procunier Safety Chuck Co. 356

R

R and L Tools 291
Rehnberg-Jacobson Mfg. Co. Insert 75-90
Reid Bros. Co., Inc. 300
Republic Steel Corp. 98
Revere Copper & Brass, Inc. 261
Rivett Lathe & Grinder, Inc. 137
Rockford Clutch Div. of Borg-Warner 290
Rockford Machine Tool Co. ..... Insert 75-90
Rollway Bearing Co., Inc. ... 70
Ross Operating Valve Co. ... 249
Rowbottom Machin Co. 403
Ruthman Machinery Co. 382
Russell, Holbrook & Henderson, Inc. 65
Ryerson, Joseph T. & Son, Inc. 156

S

Sales Service Machine Tool Co. 399
Scherr, Geo., Co., Inc. 406-409
Schrader's A. Son 345
Scott Paper Co. 397
Scully-Jones & Co. 284-285
Seneca Falls Mch. Co. 68-69
Sharples Corp. 338
Sheffield Corp. 245
Sheldon Machine Co., Inc. 358
Shore Instrument & Mfg. Co., Inc. 408
Sier-Bath Gear & Pump Co. 367
Simonds Abrasive Co. 301
Simonds Saw & Steel Co. 347
Skinner Chuck Co. 322
Smit, J. K., & Sons, Inc. 380
Smith & Mills Co. 255
Snow Mfg. Co. 334
South Bend Lathe Works 148
Snyder Tool & Engrg. Co. 269
Stahl Gear & Machine Co. 407
Standard Gage Co., Inc. 22-23
Standard Oil Co. 126-127
Standard Pressed Steel Co. .. 124
Starrett, The L. S., Co. 256
Stuart, D. A., Oil Co., Ltd. .. 129
Sun Oil Co. 243
Sundstrand Machine Tool Co. ..... Insert 75-90
Sunnen Products Co. 287
Super Tool Co. 329
Superior Hone Corp. 364
Supreme Products, Inc. 296
Sweet's Catalog Service 340

T

Taft-Peirce Mfg. Co. 275
Tannewitz Works 354
Texas Company 152
Thompson Grinder Co. 116
Timken Roller Bearing Co. Back Cover
Timken Roller Bearing Co. (Steel & Tube Div.) 97
Tomkins-Johnson Co. 383
Torrington Co. 272
Turner Bros., Inc. 40
Turchan Follower Mch. Co. 295
Tuthill Pump Co. 320

U

U. S. Tool Company, Inc. 12-13
Union Carbide & Carbon Corp., Linde Air Products Co. Div. 96
U. S. Drill Head Co. 331
United States Steel Corp. 105
Universal Engineering Co. 141
Used Machinery 412-413

V

Van Keuren Co. 280
Van Norman Co. 8-9
Veeder-Root, Inc. 35
Verson Allsteel Press Co. 144
Vickers, Inc. 361
Viking Pump Co. 411

W

Wade Tool Co. 414
Waldes Kohinoor, Inc. 333
Wales-Strippit Corp. 377
Walls Sales Corp. 406
Waltham Machine Works 403
Walker-Turner Div., Kearney & Trecker Corp. 389
Warner & Swasey Co. 24-25
Western Tool & Mfg. Co. 409
Wheelock Lovejoy & Co., Inc. 312
Whiton Machine Co. 314
Wicaco Mch. Corp. 360
Wiedemann Machine Co. 110
Williams, J. H., & Co. 332
Williamson Gear & Mch. Co. 409
Wilson Mechanical Instrument Division, American Chain & Cable 408
Winter Brothers Co. 14
Winzeler Mfg. & Tool Co. 405

Y

Yoder Company 117

Z

Zagar Tool, Inc. 373
Zeh & Hahnemann Co. 403

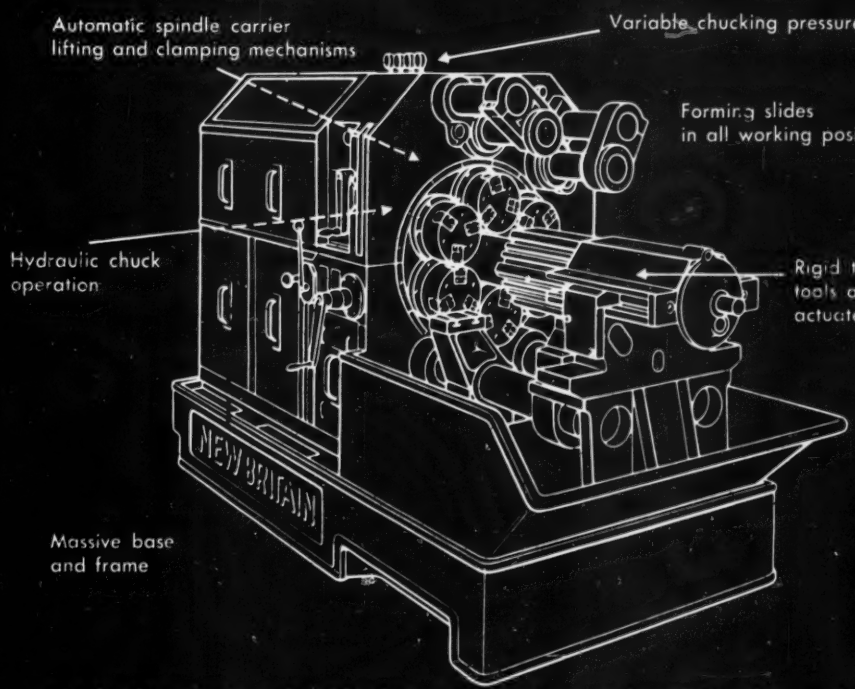
CLASSIFIED SECTION
See pages 412-413



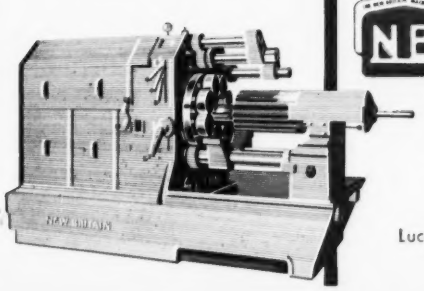
For more information on products advertised, use Inquiry Card, page 247

New Britain Builds 4, 6 and 8 Spindle Automatic

CHUCKING MACHINES



A chucker designed with the extra power and rigidity for multiple operations on forgings and castings, involving both heavy and finishing cuts.



NB

THE NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut

. . . Machines for Making Progress

Automatic Bar and Chucking Machines
Precision Boring Machines
Lucas Horizontal Boring, Drilling and Milling Machines
New Britain +GF+ Copying Lathes

NEW BRITAIN Automatics

Mills all sides of aircraft fitting in 5 minutes flat . . . *with help of TIMKEN® bearings*

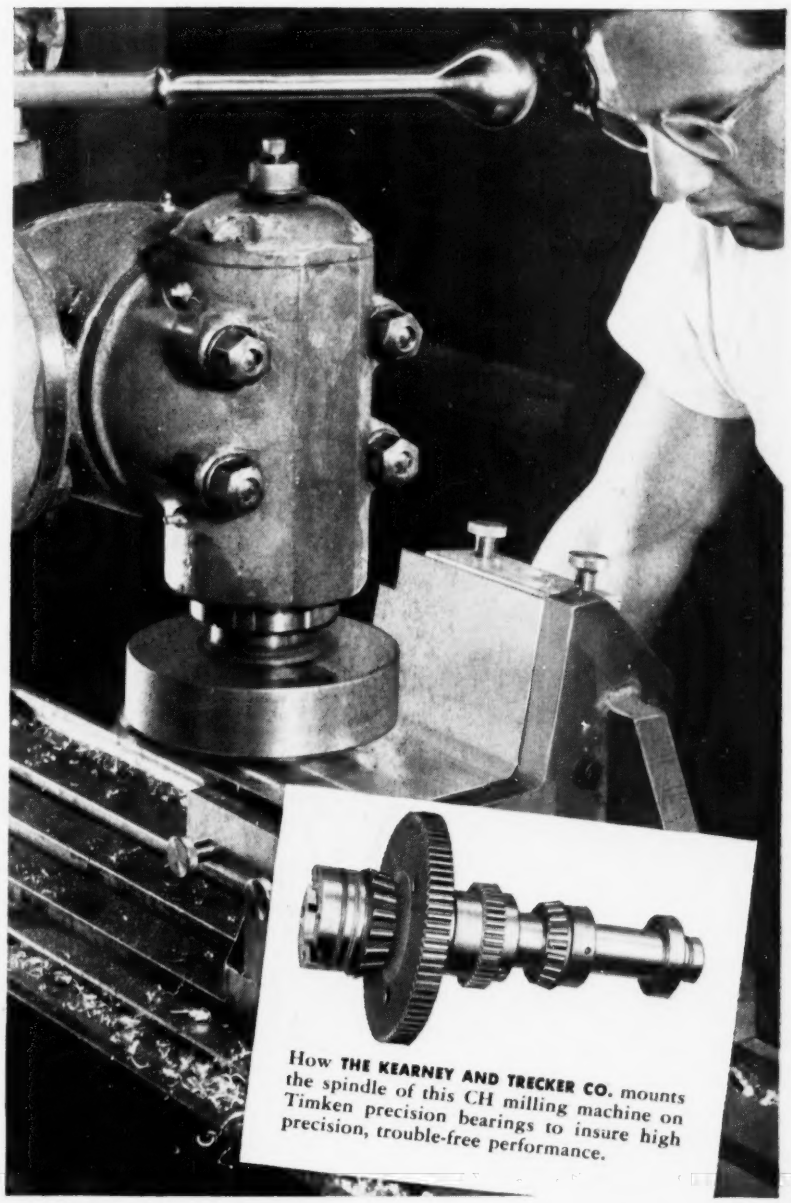
MAKING cuts .050" deep in 75ST aluminum alloy, this Kearney & Trecker Model CH milling machine mills all sides of an aircraft fitting in five minutes. Even at these high milling speeds, spindle rigidity is maintained—the spindle is mounted on Timken® tapered roller precision bearings.

Line contact between their rollers and races gives Timken bearings extra load-carrying capacity. Their tapered construction takes radial and thrust loads in *any* combination and permits fine bearing adjustment. Result: shafts are held in rigid alignment. Shaft deflection is minimized and end-play can be eliminated. Gears mesh smoothly. Spindle precision is assured.

Timken bearings' tapered construction also makes them easier and less costly to assemble. No auxiliary thrust washers are needed. Spindle maintenance is simplified.

No other bearing gives you all these advantages. Specify Timken precision bearings in the machine tools you build or buy. Look for the trade-mark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **THE KEARNEY AND TRECKER CO.** mounts the spindle of this CH milling machine on Timken precision bearings to insure high precision, trouble-free performance.

IT'S TIMKEN BEARINGS FOR VALUE!

To get the best value in bearings you may find this simple formula helpful:

$$Value = \frac{quality + service + public\ acceptance}{price}$$

Obviously a big advantage *above* the line gives you more value than a small one *below*. No other bearing can match the uniform high quality, engineering and field service and overwhelming public acceptance you get with Timken bearings.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⓪ AND THRUST →⓪← LOADS OR ANY COMBINATION →✳←